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PC MAGAZINE

Web Browser Battle Rages

Microsoft and Netscape Roll Out New Internet Explorer and Navigator Versions

NETWORK EDITION

Wireless Local Area Networks

JVC's "Infranet" Breaks Through to 10 Mbps

Build Your Own Web Site

PC Labs Tests

35 Powerful Tools for Creating Cool Web Pages and State-of-the-Art Web Sites

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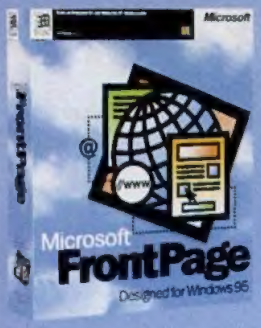

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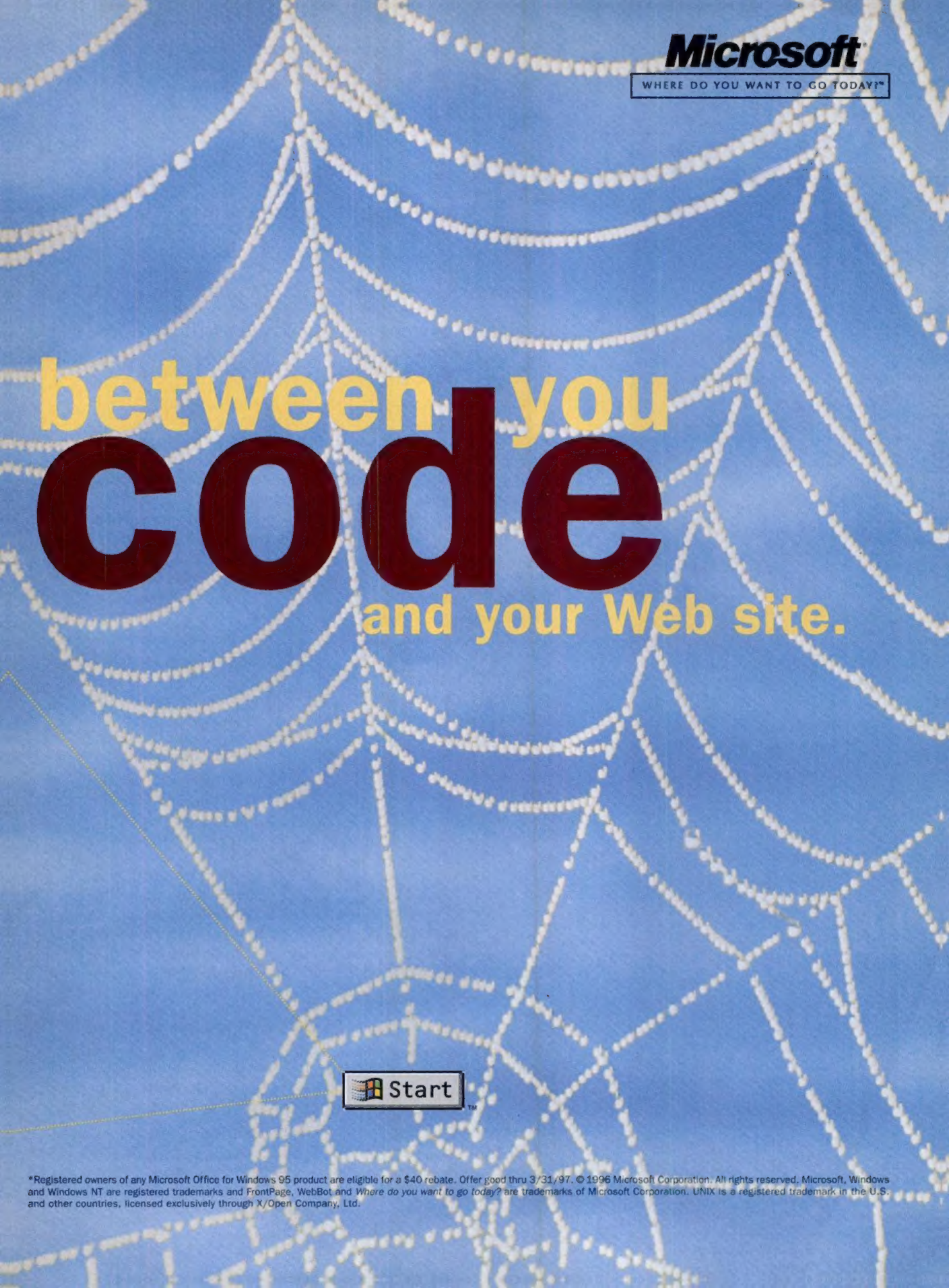

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Inside

Do you have a personal Web site? Does your company or organization have a site on the Internet or, closer to home, an intranet site? For more and more of us every day, the answer to at least one of these questions is yes. The number of Web sites and the number of people accessing the Web are growing every month at amazing rates.

You may have noticed that today's Web sites are designed better than ever before. Designers are making use of more graphics and, more important, more sensible ones—graphics that have been sized to convey meaning, not slow down your connection.

Many sites now offer access to huge amounts of such data as product information and account summaries. Some even provide the ability to track specific orders. The result is a more active, more engaging World Wide Web. That's the good news.

Even better news is that creating such sites is getting easier rather than harder, thanks to new tools. In this issue's special report, "Building Your Own Web Site," we dive into the new generation of Web page creation and management tools, from HTML editors to database access tools to Web servers.

In category after category, we were impressed by how much progress there has been in the past year and, in many cases, in just the past few months.

Almost 50 writers, editors, testers, and analysts were involved in our evaluations, which were performed mostly at PC Magazine Labs in New York and ZD Labs in California. The sheer number of our contributors, who represent our software, Internet, Online, and networking teams, is another indication that the Web is now an integral part of just about everything in the computer business.

Beyond testing and reporting on these new products, we have tried to apply some of what we've learned to our own Web site, *www.pcmag.com,* which we have redesigned to enhance the presentation of the tens of thousands of pages of information available therein.

The site includes interactive companions to many of our feature stories, huge amounts of data from PC Labs, *PC Magazine* utilities and other downloads, and, in our InternetUser section, extensive lists and reviews of Internet software. We hope you will join us there.—*Michael J. Miller*

ILLUSTRATION BY TERRY MIURA

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Building Your Own WEB SITE

BY LANCE N. ULANOFF It's easy to visit the World Wide Web; millions of people are doing it every day. It's harder, though, to become a Web publisher. You have to make tough choices not only about how to build a Web presence but also why you want to do it in the first place and what you hope to achieve: Is this a personal site, or one for your corporation? Will it have live data? In this three-part special report, we explain how to create and maintain your own commercial or personal Web site or an intranet setup for your organization. Our evaluations of HTML authoring tools, data-driven Web applications development tools, server software, and graphics tools and options will point you to the products you need to make your presence felt on the Web **101**

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Web Authoring

BY SHARON TERDEMAN Our review of 16 HTML authoring tools reveals a culture clash between HTML-in-your-face code editors and graphical systems that hide the code behind a WYSIWYG view. The best of both types give you wizards and property sheets to help you build complex HTML constructs. Some also provide diagnostics and site management features. Whether you're a professional or just someone who wants to stake a personal claim to a corner of cyberspace, here's a guide to finding the right authoring tools **115**

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Web Servers

BY ROBERT P. LIPSCHUTZ Browsers get the limelight, but central to any site are Web servers—the software that pumps HTML pages through the Internet or a corporate intranet. Besides simple pages, though, Web servers are increasingly being used for complex tasks such as creating dynamic Web documents, querying databases, serving up multimedia objects, and delivering client applets. We test 12 Web servers for Intel, Macintosh, and Unix platforms, including Microsoft Internet Information Server and Netscape FastTrack and Enterprise servers. We also rate management, database connectivity, and content-creation features to help you choose what will be the heart of your Internet or intranet site **167**

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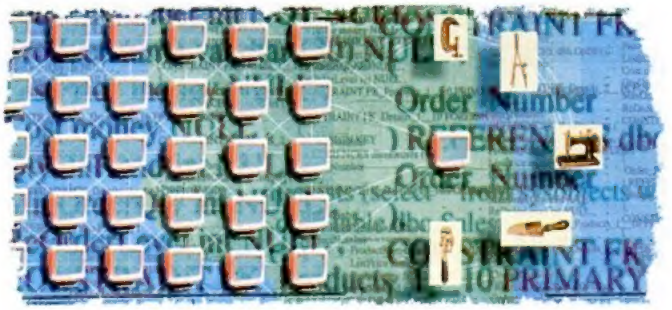

Web Database Tools

BY STEPHEN W. PLAIN Data-driven Web sites are hot, and vendors are scrambling to supply programming tools to build them. Our review of eight first-generation Web database development systems found them in various states of readiness. Some are little more than traditional client/server tools with Web access bolted on. But others are more than ready to meet the challenge of using the Web as a data-access medium—no mean feat, given the technical hurdles involved. If you're planning an industrial-strength data-driven site, here's where to start selecting your tools **205**

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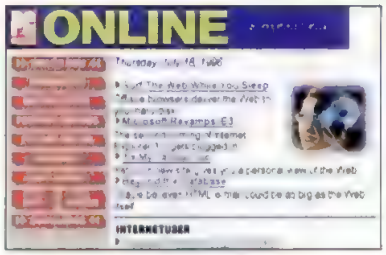

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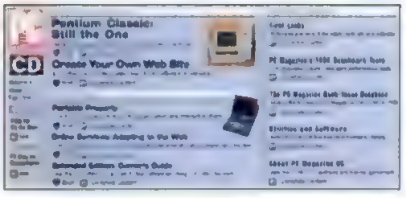

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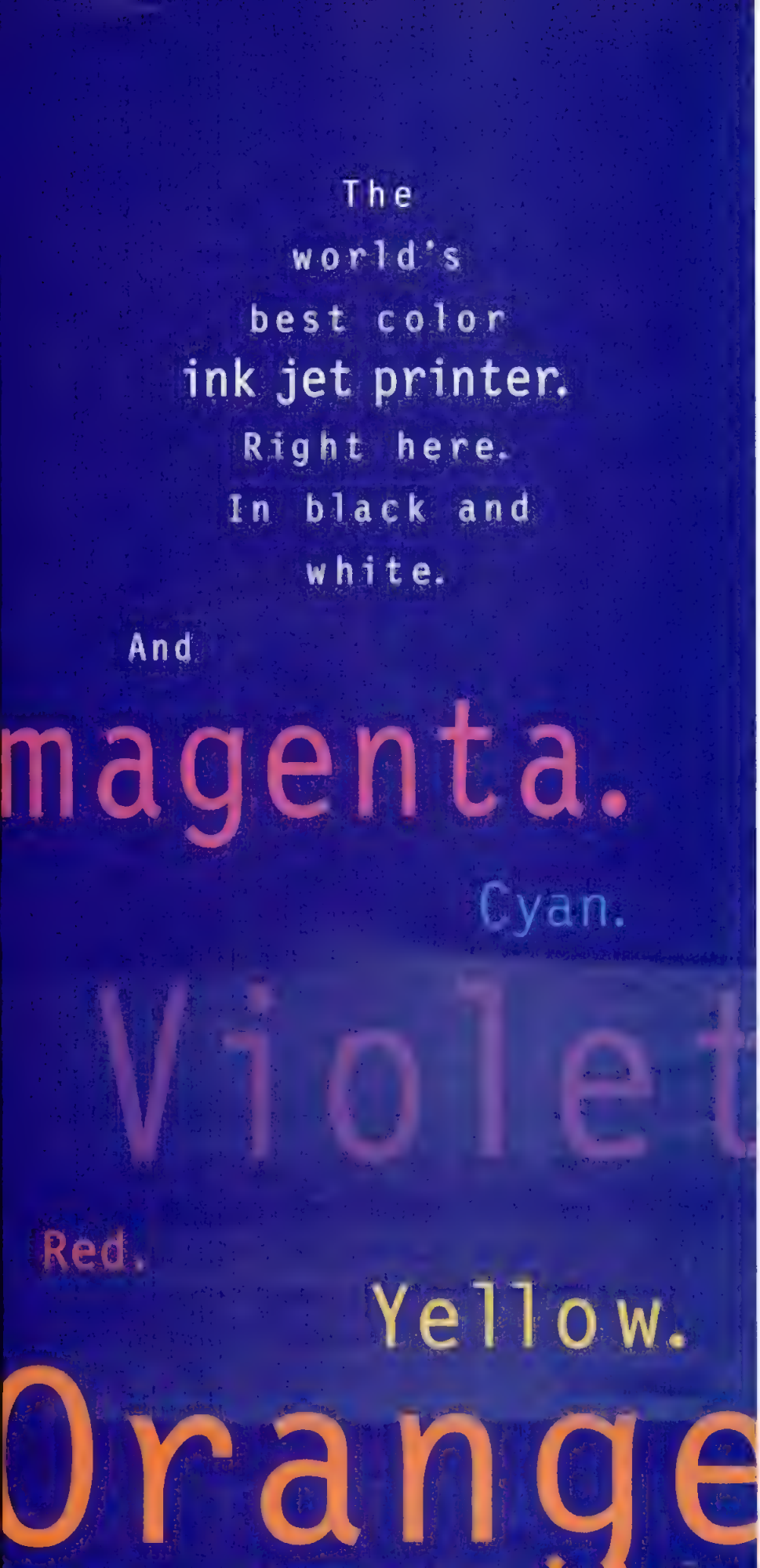

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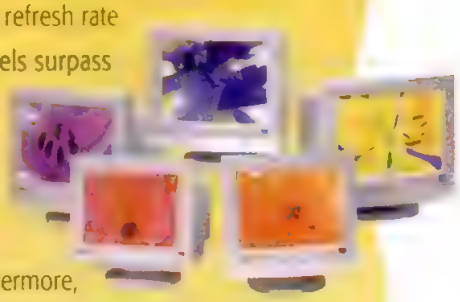

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Letters

BASKET FULL OF UTILITIES

I found your May 14, 1996, cover story, "The Ultimate Utility Guide," very interesting, but it seemed aimed primarily at Windows 95 applications, not Windows 3.1 programs. There must be many users like me who don't intend to upgrade to Windows 95 but still need a source of information in the Windows 3.1 arena.

JOSEPH S. ROSENTHAL
St. Peters, Missouri

Your unbiased cover story was helpful and informative. Choosing utility programs can be difficult, especially for a new computer user like me. It's easy to get a distorted view of reality if you believe everything that a manufacturer claims.

JOHN DOWNING
Naples, Italy

Such an all-encompassing compendium of information was a godsend in my efforts to move successfully to Windows 95. Because of the excellent reviews and advice, I was able to make two smart purchases (CleanSweep 95 and Norton Utilities for Windows 95) and avoid several products that are of questionable functionality.

CHRISTOPHER BELCHER
via PC MagNet

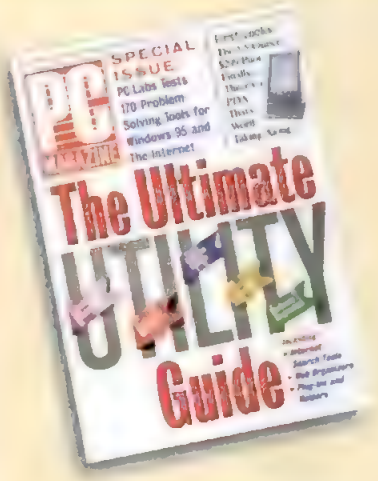
An uninstall utility is an attempt to plug holes that should have been filled by the operating system. It's the operating system's responsibility to keep everything running smoothly. Shouldn't that include knowing where pieces of applications are so they can be safely removed? If the purpose of an operating system is to allow us to run applications, why not make it easier for us to remove the ones we no longer want?

DANIEL SCHWARTZ
Norwood, Massachusetts

As a follow-up to your Windows 95 utilities story, I would like to see a similar article on Windows NT utilities. Currently, the cost of utilities for Windows NT is very high because of a lack of competition, along with the view that the only buyers of these products are large corporations. With Windows NT 4.0 right around the corner, this will surely change for the better.

ROBERT SERAFINI
via PC MagNet

Why, after covering many useful utilities for Windows 95, did you ignore backup, arguably the most important utility category? Choices of backup utilities are newsworthy by their very scarcity, and the few I have found are both awkward and slow. Perhaps



This all-encompassing compendium of information was a godsend.

you couldn't find any candidates to recommend either. I can only hope that you plan to cover the backup software arena for Windows 95 completely in the future.

ROBERT M. KEESLING
via PC MagNet

Thank you for presenting such a complete view of the utilities available today. I was especially glad to see the big section on OS/2 utilities. Two products I would have liked to see *PC Magazine* put through the wringer are the Corel WordPerfect Suite and the new Mustang Wildcat communication package. I hope to see them reviewed soon.

JOHN WESTGATE
Chenango Forks, New York

PREDICTING THE FUTURE

Concerning "Or It Could Just Be the Apocalypse" (Abort, Retry, Fail?, May 14, 1996): I was amused by your question of what to call the next decade, and I read the paragraph to my wife. Her response: "Given the moral tenor of the times, it should be called the 'Aught Naughts.'"

STEVE PLACE
Bristol, Connecticut

VIEWS FROM THE SHORE

I think Jake Kirchner missed the boat with his April 23, 1996, Pipeline column, "Buying Retail: It Takes Two to Make an Honest Deal." For years people have used local retailers as a source of information about products, and they then purchase the selected product from a mass merchandiser to shave a few dollars off the price. It's because of this buying pattern that small local independent computer stores are becoming extinct. The industry can't survive if everybody buys direct.

LAYNE P. HEINY
via the Internet

I must say I have yet to find a computer retailer who will give me technical handholding for free, and if one exists, it's being taken advantage of. Further, wasting a salesperson's time is inconsiderate only if the salesperson is working on commission. Salespeople who expect me to pay more to hear their so-called expert sales advice and wisdom so they can pocket the difference are what I call contemptible.

ERIC WHITEHEAD
via the Internet

WARNING: SHARP CURVE AHEAD

Concerning Robert Bender's letter to Ask Our Advisors in the May 14, 1996, issue ("Old Program, New Printer"): He should be warned that even if making the move to WordStar for Windows solves his printer problem, it might cause more headaches than it relieves. When I upgraded, I found that the new version did not have many of the functions that I depended on in the older program. This is one of the reasons why many people are no longer automatically moving to new versions of software. Some of the fancy bells and whistles promoted in older versions can be lost in the upgrade.

B.TERRENCE ZESZUT
Chicago, Illinois

OLD AND IN THE WAY

In Bill Howard's column "The Dumb Terminal Is Just That" (May 14, 1996), he notes that one day soon, the price of a good multimedia PC will drop below $1,000 and be affordable for almost everyone. The truth is, you could have a $1,000 PC now, if a 486/33 CPU with no external processor cache, 4MB RAM, a 640-by-480 monitor, and a 2,400-bps modem would suffice. But how are you going to put Windows 95 on it? Or Descent? Or Encarta? By the time a 100-MHz Pentium PC gets to the $1,000 mark, it will be just as much a fossil as a 386/16 PC is today.

JIM HART
via PC MagNet

Howard writes, "There's some anecdotal evidence that families with incomes as low as $20,000 will try to find a way to acquire a PC." This is an insult to me and my financial peers. It's a shame that Howard feels that people outside the wealthy elite are the butt of jokes.

ROBERT LUHRMAN
Port Orchard, Washington

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Letters

CANCEL MY SUBSCRIPTION— NOT

I congratulate Bill Machrone for giving support to the idea that government edicts will not solve parenting problems ("Cancel My Subscription," May 14, 1996). I firmly believe that my children, and my own actions, are my responsibility and that I do not need any federal or state agency to save my children from the horrors of this world.

SHAWN DOWNS
via PC MagNet

Well said. I wish more parents would choose to supervise their children closely rather than trying to take away everyone else's right to free speech.

TINA KOYAMA
via PC MagNet

Covering the telecommunications debate is certainly germane given its potential impact on computer users; in my estimation, Machrone has presented opposing views in a balanced fashion. Though one columnist's view might be opposed to mine, I hardly think that would be a good reason to cancel my subscription. There is still room for more than one opinion in this democracy of ours.

HOWARD ZELIZER
via PC MagNet

BUT WAIT, THERE'S MORE

In the May 14, 1996, Solutions section "Correcting AutoCorrect in Word," you give the ALT+0146 method of entering the curly apostrophe in Word for Windows 6, but there's an easier way. Using the menu item Insert | Symbol | Special, you can enter a curly apostrophe at any time by typing Ctrl-Apostrophe followed by Apostrophe. The other "smart quotes" symbols have equally brief keyboard shortcuts.

NORM DRESNER
Severn, Maryland

You missed a main feature of AutoCorrect. If I wanted to have Word's AutoCorrect change *cd-rom's* to *CD-ROMs*, I would do as you suggested but I'd define the entry word as something simple like *cdr*. For example, I have set up the AutoCorrect feature on my PC to change *PRR* to *Parks and Recreation* and *dpt* to *Department*, both of which streamline my writing reports.

BOB EWELL
Colorado Springs, Colorado

BIG APPLE, LITTLE APPLE

John Dvorak's May 14, 1996 column, "Apple's Big Mistake," was right on. I know several Mac users, and they all have an anti-PC attitude. I, on the other hand, have gained much respect for Apple over the years. I've even considered buying one and using both Apple and PC platforms.

DAVID BARTON
Portland, Oregon

Apple behaves in such a way that it will not have to face the scary reality of being a successful computer company. In spite of a very attractive product, it has managed to keep the market share to a comfortable 10 percent. As a customer, I feel that every other vendor tries hard to interest me in its products, but Apple sends me the subtle message, "Go away." I liked Apple and bought its products, but if I am going to continue liking Apple, I need a yes answer to the question: "Does Apple like me?"

DEMETRIOS VOREAES
via PC magNet

SHEDDING SOME LIGHT

The two-part PC Tech "Inside OS/2" article "Understanding the OS/2 CONFIG.SYS File" was informative and very much appreciated. It clarified the relationship of the DOS commands in the file to the overall functionality of OS/2 and helped me understand how the file functions.

EDWIN H. PORTER
via PC MagNet

WEB CHARACTER

In "Adapting to the Web" (June 11, 1996), you maintain your usual pro-Microsoft position. One needed a fine-tooth comb to determine that it is possible to access the Web or subscribe to an online service without the aid of a Windows product. A PC user can buy DOS from IBM if a character-mode operating system is adequate, and—if not—there are pure 32-bit operating systems, such as Linux or OS/2 Warp. If even 5 percent of PC users use non-Microsoft operating systems, then it would seem fair to expect reviews of software for these systems to take up 5 percent of the magazine.

VERNON TONNESEN
Weeki Wachee, Florida

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CORRECTIONS AND AMPLIFICATIONS

In the Table of Contents of our June 11, 1996, issue, we incorrectly attributed the authorship of the PC Tech Utilities column "Explore Hotkeys in Windows 95" (page 281). The actual author (whose byline appears correctly in the story itself) is Gregory A. Wolking.

Our review of IBM Corp.'s IBM AntiVirus Desktop Edition in the May 14, 1996, feature "Antivirus Utilities" (page 145) erroneously stated that we found the product's cleaning abilities somewhat unreliable because it waited until the end of a scan to notify the user of infections. The reviewer's intent was to question this user-interface decision, not the product's overall reliability.

In the same review, we incorrectly stated that Dr. Solomon's Anti-Virus Toolkit, from S&S Software International (page 143), lacked file-cleaning capabilities. The program can clean individual files, as well as entire directories and drives.

Also in the May 14, 1996, issue, our story called "Network Antivirus Solutions" (page 158) incorrectly stated that NetWare NLM in IBM Corp.'s IBM AntiVirus Enterprise Edition could not scan incoming and outgoing files simultaneously.

The fact file for the IBM PC350 that we tested in the First Looks article "Pentium/200: Fast PC or Low-Cost Workstation—Your Choice" (July 1996) incorrectly stated that the system came with 16MB of RAM. In fact, the IBM PC350 comes standard with 32MB of RAM. The $4,462 list price is correct.

In the First Looks review "Corel Web.Data Delivers Instant Internet Databases" (June 25, 1996), we listed the company phone numbers incorrectly. The correct phone numbers for Corel Corp. are 800-722-6735 and 613-728-3733.

The NEC SuperScript 860 discussed in New & Improved ("Writing the Script on Lasers," June 25, 1996, page 80) features 600- by 600-dpi resolution, not 60- by 600-dpi.

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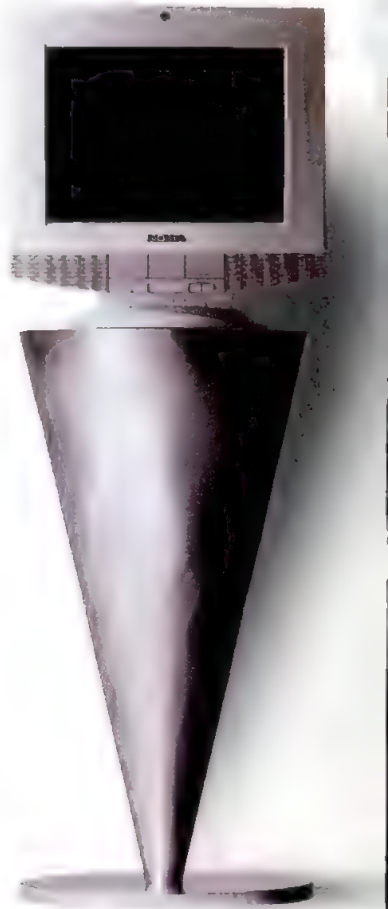

447Xav—Professional-caliber display with integrated speakers, sub-woofer, and microphone

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The audio capabilities of the media-ready series extend to the built-in microphone set in the top of the bezel (at ideal voice height). This feature completes the requisites for computer telephony. The 447Xavc model even houses the world's first inboard color video camera for video-capture and conferencing. Truly, the media-ready series enables the complete convergence of computing and communications.

Of course, each of these systems comes with full digital controls and on-screen menu-driven adjustments (which Nokia also pioneered). Yet their pricing is remarkably competitive. All of which makes the new 447X series a necessity for anyone making full use of their computer. After all, the best way to meet the standards is to work with the people who set them. Visit us at www.nokia.intltech.com or call 1.800.BY.NOKIA, Dept. N412.

447Xavc—Adds to X series features with built-in color video camera

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MICHAEL J. MILLER

Mergers & Apprehensions

Most reputable newspapers and magazines, *PC Magazine* included, have conflict-of-interest policies that, among other things, prohibit a journalist from having financial interests in a company covered by the publication. But although journalists work under such constraints, the larger organizations that employ them usually do not. Nowadays, with the flurry of media mergers and explosion of Internet-related businesses, just about any news organization you can think of is part of a larger organization that has financial relationships with other companies. Today's capital requirements and information-distribution infrastructures mean that almost any major news organization must foster such relationships to succeed. The economics of the marketplace don't allow for complete independence anymore.

BAD PRESS

More potential for conflicts of interest than ever before is giving rise to legitimate concerns.

As many of you are aware, Ziff-Davis Publishing, the parent company of *PC Magazine*, was acquired earlier this year by Softbank Corp., the largest distributor of software in Japan and the owner of Comdex and other high-tech trade shows. What you may not be aware of is that in the intervening months, Softbank has become one of the largest investors in Internet start-up firms. Softbank owns 37 percent of Yahoo! and has been a significant investor in Agents Inc., CyberCash, Decisive Technology, Electric Classifieds, FreeLoader, inquiry.com, Interactive Profiles (I/Pro), USWeb, and many other companies. Ziff-Davis itself does not manage most of these investments, but it does have a joint venture with Yahoo! to create publications, and it has created a new division that produces "The Site," a nightly television show broadcast on MSNBC, a joint venture between Microsoft and NBC.

No one at Ziff-Davis or Softbank has ever suggested we at *PC Magazine* change our coverage as a result of these investments. But the fact is, there's more potential for conflict of interest than ever before. Of course, we are hardly alone in this regard. Our major direct competitors, IDG and CMP Publications, also have stakes in several Internet start-ups. IDG, for instance, was an early investor in Netscape. Advance Publications has a large stake in *Wired*, and Intel is a major stockholder of clnet.

The general press is in the same situation. Knight-Ridder, publisher of the *San Jose Mercury News*, was an early Netscape backer, and Time Warner has also been an Internet-related investor. And most publications—including *PC Magazine*—have deals with one or more commercial services for distributing content online.

All of this gives rise to some legitimate concerns. At *PC Magazine*, senior managers do not approach reporters and command, "You will say only good things about these companies." And I believe that the same is true of most major news organizations. These publications typically have a history of independent reporting that, for the most part, is what attracts readers. It's not worth the risk, and publishing companies understand that.

The real problem has to do with a more subtle brand of influence. As companies forge relationships with one another, senior executives are more likely to know and to work with their counterparts at other organizations. That undoubtedly affects the executives' knowledge and opinions of those organizations, and this can trickle down to the rest of the company in unintended ways. Take this hypothetical example: Someone at Softbank discusses a potential Internet-related investment with a senior manager at Ziff-Davis, who then mentions the technology to a colleague who, in turn, mentions the company's Web site to me. If it seems like a cool Web site, I might mention it to someone else at the magazine, leading eventually to coverage, all without even knowing that Softbank was considering making an investment in that company.

So what should we, as journalists, be doing about these potential problems? First, we can make sure we talk to the widest variety of sources, representing both companies with which we have relationships and those with which we are not affiliated. Second, when we review products, we can make sure we use objective, reproducible methods. PC Labs' benchmark tests, for example, have always been and will continue to be the cornerstone of *PC Magazine*'s product reviews. Finally, we must be as forthcoming as possible whenever we know of a potential conflict. As a reader, you have the right to demand this of *PC Magazine*—and of the other places that provide you your news. □

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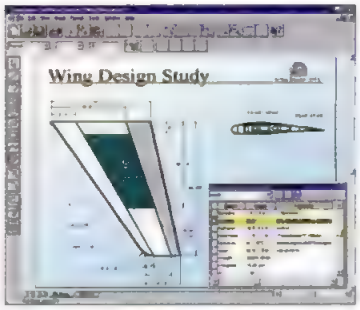

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CIRCLE 040 ON READER SERVICE CARD

Collaboration on Call

Videoconferencing takes a backseat to document sharing.

Desktop videoconferencing hasn't exactly lived up to expectations. Apart from the underwhelming video quality and technical limitations imposed by telephone and even ISDN lines, the novelty of videoconferencing wears off pretty quickly. As businesses discover that setting up a videoconference may be a huge hassle, they're turning to a simplified solution: document conferencing, which enables multiple groups of people at different locations to share documents, collaborate on and edit them, and discuss them aloud—all on the Web and in real time.

The development community seems to have been in a state of hyperactivity since several big players decided that desktop conferencing software would be a killer app for the Internet. Several pieces that have held back the document conferencing market until now are finally falling into place, and recent acquisitions and partnership announcements are indications that document conferencing is gaining momentum.

The roster of companies working on the technology is impressive. Last year, Netscape Communications acquired InSoft and its CoolTalk browser plug-in for document conferencing, which Netscape plans to integrate into its LiveMedia strategy. Netscape Navigator 3.0 already includes CoolTalk, as will many of Netscape's other products. Microsoft, in turn, recently made its NetMeeting software available for free downloading and plans to build it into future versions of Windows and Internet Explorer.

ConferTech, at one time the only bridging service that connected remote locations, is now joined by other service providers. Sprint and VideoServer are collaborating on a service for multipoint conferencing that works with NetMeeting. MCI's multipoint Internet conferencing services will also work with NetMeeting. And more than 20 other companies have announced products compatible with NetMeeting.

Meanwhile, Quarterdeck has entered the fray with its TalkShow document conferencing software. FutureLabs has released a toolkit that developers can use to build interoperable document conferencing software. And Intel has just posted, on the Web, new Internet phone software that works with NetMeeting.

Document conferencing has moved to the forefront almost out of the blue, thanks to a technical standard known as T.120 that enables software from multiple developers to interoperate. "Document conferencing" is a catchall for different levels of functionality, from whiteboarding to full-fledged document sharing. In both scenarios, you schedule a conference with a data bridge service such as ConferTech or MCI. Participants then launch their software, connect via a modem or a TCP/IP network, and join in the conference. If it's a whiteboard conference, then participants have access to drawing tools for annotating documents. In full application sharing, one PC runs the application, but all participants can take control of it.

"Document conferencing addresses one of the fundamental weaknesses of the PC," says Joe Sullivan, director of multimedia teleconferencing at ConferTech. "All the information is stored on your computer, but there's no way to share it and collaborate in real time. You have to e-mail it, fax it, or FedEx it."

Technical hurdles—especially running applications over low-bandwidth modems—remain, but in the upcoming months, you can expect to see T.120 capabilities built into Web browsers.

So where does video fit in? According to research from Gartner Group, 80 percent of conferencing requirements can be met through audio and data conferencing. ConferTech's Sullivan adds that, unlike videoconferencing, document conferencing "doesn't seem like you're managing a lot of technology."—*Carol Levin and Sebastian Rupley*

Internet Mouse

The new Microsoft IntelliMouse has a wheel between the buttons that you can roll in either direction to scroll through long Web pages.

ILLUSTRATION BY STEVEN SALERNO

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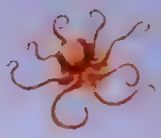

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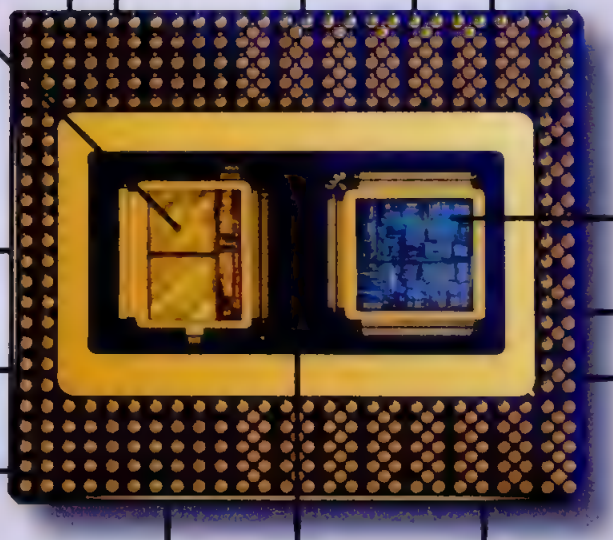

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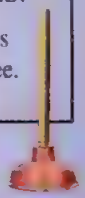

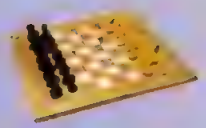

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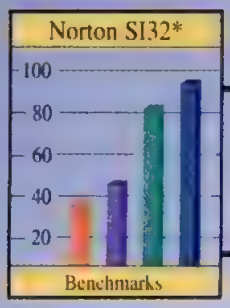

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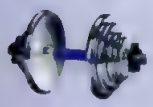

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Many Images, One File

Kodak, HP, and Microsoft back a new graphics format.

If Eastman Kodak has its way, a very different breed of graphics file—dubbed FlashPix—will take shape this fall, with interesting implications for Web browsers and software applications.

FlashPix is positioned as a universal file format that will make it unnecessary for users of software applications, Web browsers, online services, and peripherals to have to convert as often between mainstream graphics file formats, such as JPEG and TIFF, and proprietary formats. To make the file format truly universal, Kodak is going to have to win more partners, although it already has partnerships with Hewlett-Packard, Live Picture, and Microsoft.

Microsoft is adopting FlashPix within Internet Explorer and within Microsoft operating systems and applications, while HP and Kodak will use the format in software designed for peripherals such as scanners.

The FlashPix format's most unique property is its support of multiple resolutions within one file. A FlashPix file contains a high-resolution version of an image, plus a hierarchy of many lower-resolution copies. The implications for Web graphics are significant. For example, a browser user might point to a picture and download a low-resolution version, but later print the image at a higher resolution.

The FlashPix architecture has implications for image storage as well. For example, you can link image edits to an original image file but store those actual edits separately. Thus, the need to store multiple iterations of a whole image file could be eliminated. The FlashPix file format also employs Microsoft's OLE structured-storage format, which allows descriptive information about an image file to be stored directly within that file.

FlashPix does face obstacles. Although graphic artists—who often store multiple iterations of one graphics file—may save disk space thanks to FlashPix's linking capability, Kodak concedes that the hierarchical storage makes individual FlashPix files larger than those of other file formats. (JPEG compression will be standard.)

As with any new file format, FlashPix depends on compatibility with a broad array of applications. This fall, Kodak, Hewlett-Packard, Live Picture, and Microsoft will release a software development kit for the FlashPix format.—*Sebastian Rupley*

PDAs Try for a Comeback

After a struggling start, have they finally found themselves?

Since they began to appear a few years ago, personal digital assistants (PDAs) have amounted to little more than high-tech toys for affluent gearheads. Some, such as the Apple MessagePad 130 with Newton 2.0 operating system, the Hewlett-Packard 200LX, and the Psion Series 3a, have sold in moderate volumes to consumers and vertical markets.

Although mass-market acceptance has eluded these high-tech answers in search of a problem, PDAs may yet emerge from that shadowy realm between expensive notebooks and electronic organizers. First, there's evidence of a growing demand for simple, compact communications devices in a world that's increasingly fax-happy and e-mail-centric. PDAs have gained the hardware resources, operating system power, and communications versatility to reach out and touch someone—with or without wires.

PERFECT FIT: *This PDA/cell phone combo uses Europe's GSM system.*

ILLUSTRATION BY FRANCISCO CACERES

For communicators running the Magic Cap operating system, General Magic has introduced Presto Mail, which provides connectivity with corporate mail servers, and Presto Links, a graphical Web browser. Apple has greatly enhanced Newton's communication features, and developers have produced a full range of mail and Internet products in response. Psion's PsiMail software provides feature-rich integration with corporate e-mail systems. And in the wings is the HP OmniGo 700LX (for now, available only in Europe), which combines a digital GSM cellular phone with the HP 200LX.

Second, PDAs may be able to tap the vast reservoir of potential users who have so far resisted computers. In their professional and private lives, these people either don't need a full-blown computer or refuse to plunk down the still-substantial amount of money for a desktop or notebook PC. "Some people are still using paper and clipboards. They can't use laptops because of cost, difficulty, or simple impracticality," argues Jay Wright, president of PDA software development company Wright Strategies.

And finally, there's Microsoft. The air is thick with rumors surrounding Pegasus, a PDA operating system that could legitimize the whole industry. "Pegasus will bring PDAs and mobile computing back into the limelight again," says Wright.

Despite that anticipation, industry veterans well remember past rumors of imminent Microsoft action in the PDA market. A couple of years ago, reports arose of gadgets running a Microsoft OS, called WinPad, that never saw the light of day.—*Jonathan Matzkin*

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*Source: PC Data Data for May 1996.

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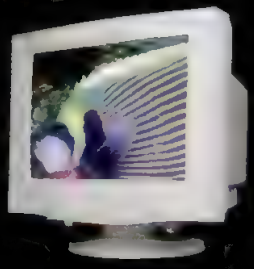

Acer

CIRCLE 087 ON READER SERVICE CARD

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New Web Tool Reads Minds

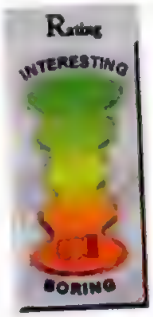
U-zines do it your way.

Information is like water. It gets polluted," says Ken Lang, the 29-year-old founder of Empirical Media, based in Pittsburgh, Pennsylvania. Lang, who developed an innovative filtering technology in conjunction with his doctoral work at Carnegie Mellon University, has turned his research on how a computer program can continually learn into a company that may very well help you waste less time on the Web.

Lang's idea goes like this: The more his filtering software—called WiseWire—learns about what you like and don't like, the more useful it becomes.

Like other search engines, WiseWire relies on spiders working around the clock, scouring the vast resources of the Internet—including Web pages, Usenet newsgroups, newswires, and premium content sources. Compared to search engines that offer voluminous responses to search queries, WiseWire offers a more highly evolved system based on "collaborative filtering," in which the first readers of a document help judge its value for later readers. In this way, the software will filter out unappealing content before it's presented.

By asking you to rate your level of interest in information delivered to you, the software continually learns what you find useful and is thus able to predict what kinds of information you would find the most valuable. Because every user contributes feedback to the rating system—that's the collaborative part—the overall quality of information-gathering improves over time.



OPINION POLL: *Feedback counts.*

Lang is not the first developer to create agents that learn. Agents Inc.'s firefly, developed at the MIT Media Lab, also uses collaborative filtering to suggest movies and music based on your preferences and the preferences of other like-minded firefly users.

WiseWire isn't the engine of choice for every kind of search, says Lang. For instance, if you have a one-time search request—you want to buy a new car, for instance—a conventional search engine will do. But if cars are more a long-term interest for you, then reading one of WiseWire's car "U-zines" would be more useful. U-zines organize information by topics like sports, hobbies, investments, travel, or careers. You can pick from an existing U-zine or create a new one.

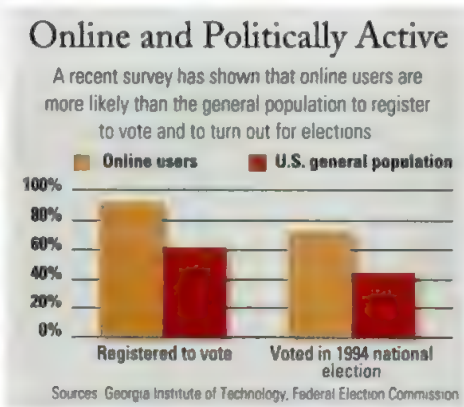
Scheduled for release in the third quarter of this year, WiseWire will be supported by advertising fees and will be free for its users.—*Carol Levin*

Voters Flock to the Web

Cyberspace is fertile ground for candidates' messages.

Say you're running for public office and you need to get your message to the voters. The Web may be a good place to take your campaign, because it seems that people who use the Web are more likely to vote than those who don't.

More than nine out of ten people responding to the Georgia Institute of Technology's recent online survey of 11,700 Web users reported that they were registered to vote. 63 percent of respondents had participated in their most recent local, legislative, or national election. That proportion of voter registration and turnout is higher than it is for the general population.



"These numbers suggest that the Web can potentially play a significant role in politics," says Georgia Tech researcher Jim Pitkow. "The Web appears to be a viable way to distribute political information, because there really are large numbers of registered voters regularly using the Web."

The survey also uncovered the political leanings of Web users. More than 30 percent of the respondents described themselves as moderate, 35 percent as liberal or very liberal, and 21 percent as conservative or very conservative.

The Web users surveyed were also politically active in other ways: 31 percent wrote to elected officials, 23 percent discussed political issues, and 22 percent signed petitions. And over 40 percent said they had become more politically involved since going online.

The survey also calls into question the validity of information-gathering on the Web. 26 percent of the respondents admitted falsifying the information they provided when registering at Web sites.—*Carol Levin*

PC Magazine Online Events

ONLINE

WWW.PCMAG.COM. Come visit PC Magazine Online on August 16 and check out our new design, as well as our daily **InternetUser** updates, **Trends Online**, and interactive reviews. From August 12 to 16, learn how to create your own CD with associate editor Jae Yang.

PC MAGNET. From this online service of ZD Net available through CompuServe (GO PCMAGNET), you can download utilities (GO TIPS) and join in discussions of new products (GO EDITOR). **First Looks Plus:** From August 19 to 23, discuss Cyrix P200 PCs with staff editor John Morris and company representatives. From September 2 to 6, join in a discussion of Web browsers with contributing technical editor Edward Mendelson, senior technical editor John Clyman, and representatives from Microsoft and Netscape. **Features Plus:** From August 26 to 30, join in a Web server discussion with staff editor Todd Spangler. **PC Magazine CD Event:** From August 19 to 23, discuss the ultimate utilities with our PC Tech team.—*Tin Albano*

PIPELINE

By Jake Kirchner

Married, with Web-Surfing Children

At first reading, the latest statistics on children's growing access to computers and to the online world are encouraging. Almost 50 percent of all homes have personal computers, according to figures quoted recently by The Children's Partnership. Last year, the organization added, the number of households online rose to 18 million, from 11 million the year before.

Not all the figures are optimistic, however. In a new update to its report "America's Children & the Information Superhighway," The Children's Partnership noted that whereas 82 percent of high school students from affluent families have access to computers at home, only 14 percent of high school students from poorer homes do. Given the importance of computer skills for future job options, this disparity is a real and growing problem.

But even though I share the concern about the long-term effects of this disparity of access to computers and online resources, I also worry about what kids are doing online once they get there.

The computer industry has been pretty self-congratulatory about the fact that the average number of hours children spend watching television has decreased as the time they spend online has grown. The assumption is that the time online is better spent. But is that really so?

Kids are spending more time online and less time in front of the TV. But is that time better spent?

In the near future, online access is unlikely to be of much help to most kids. Sure, once there's greater bandwidth available to homes and schools, students will be able to do more truly educational work on the Net. But today, a trip to the library is still a much more time-efficient and productive method of doing high school–level research.

Yes, a wealth of information is available on the Internet and through online services, but there's also a large and growing amount of worthless material. In the process of becoming more commercial, the Web is bound to attract the kind of brain-deadening dreck that's the standard fare of TV these days. What's to stop the casual sex and gratuitous violence that fills our children's TV screens from taking over the Web?

Since the Internet's medium is not publicly owned—as are the airwaves—no regulatory agency has any influence over its content. And the public outcry and judicial rulings against the Communications Decency Act all but guaranteed that the Internet will be largely free of official censorship in the future. We can lock out online porn and limit the access to other material we find offensive, but technological approaches to screening digital signals are hardly foolproof, let alone kid-proof.

Parental control sounds reasonable, but how effective can that really be? You know a child sitting in front of a television is wasting his time. But if you drag him off to the local library to study or to research a term paper, you have no idea how much time he'll spend chatting with friends or reading magazines or slipping out to the parking lot to cadge cigarettes.

No matter how good a parent you are, you can't supervise your children every minute, whether they're in front of a television, at the library, or on a computer. I don't know the solution to eliminating the pernicious influence of television in our children's lives, but I do know that turning off the set and giving our children a computer and a modem is not the answer.

Enhancing all children's access to online resources is important. Monitoring and controlling that access is even more important.

Bright Future for Flat Panels

Advanced displays move out of the lab and onto the shelves.

Field emission displays (FEDs) may be the most anticipated of all innovative flat-panel technologies. In theory, FEDs have all the benefits of a standard cathode-ray tube display in that they rely on light emitted from phosphors that have been excited by electron beams. FEDs also have the best features of flat-panel technologies: they are thin, and they can be made using standard semiconductor fabrication processes.

PixTech, based in Santa Clara, California, has taken the lead as the first company to ship samples of an FED panel. Manufactured at the PixTech factory in Montpelier, France, these first monochrome panels—which have 320- by 240-pixel resolution and measure 5 inches diagonally—are packaged in housings less than an inch thick. Unlike an LCD panel, the FED's emissive design has no limits on viewing angles. FEDs are also small, rugged, and bright enough to be read in strong sunlight conditions.

These first panels use green phosphors, but PixTech has also demonstrated a 6-inch-diagonal panel with full color and response times sufficiently fast to show full-motion video. PixTech has no plans to build notebook displays but will license its technology instead.

Meanwhile, for the Japanese market, Sony is readying its new Plasmatron technology, a hybrid of LCD and plasma. A conventional active-matrix LCD uses one or more transistors at each cell location to switch the cell on and off. This provides good image quality and fast response, but the panel's price rapidly increases with size. Imperfections and failed transistors lower yields substantially, adding to the cost. As a result, active-matrix LCDs are competitive only up through the 13- to 14-inch-diagonal-screen range.

THIN IS IN: *Check out this FED's viewing angle.*

PHOTOGRAPH COURTESY OF PIXTECH

Sony's new Plasmatron technology uses a combination of horizontal plasma channels and vertical electrodes—instead of transistors—to switch LCD cells on and off. The result is a simpler fabrication process that scales easily to larger sizes and produces higher yields than active-matrix LCDs.

At present, Sony intends to develop this technology for only the Japanese market. In time, however, we may be using large panels for entertainment and data display that rely on this plasma-switched LCD technology.—*Alfred Poor*

(Of course, you'll have to pay a little less for it.)

O.K. You know where you want to go. Now, how fast do you want to get there?

With the new Winmodem from U.S. Robotics, you actually harness the power of your Windows operating system to fax, check E-mail, and search the net faster and more efficiently than with any other modem.

Not to mention, of course, more affordably.

Plus, unlike other modems, Winmodem gives you the proven compatibility and reliability of Sportster,® the number one selling modem in the world. It's easy to install, it's Microsoft Plug and Play certified, and it can be upgraded instantly to 33.6 Kbps with one call to the U.S. Robotics BBS.

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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

WEB BROWSERS

Microsoft Takes the Offensive in The Browser Battle with Netscape

By John Clyman, Edward Mendelson, and Brian Nadel

The tide in the Web browser battle has quickly turned. What three months ago looked like a conflict dominated by the Netscape juggernaut has become a genuine war of the Web, pitting two competitors of equal strength against each other. (For more information, see "The Web at War," May 28, 1996.)

Based on hands-on evaluations of the latest developmental beta programs, Microsoft Internet Explorer 3.0 has fully caught up with Netscape Navigator. Both deliver a wide variety of features and provide a framework for satisfying the creative urges of Web page designers as well as users' hunger for Internet-based multimedia. IE has taken the offensive on the interface front and in value—it's free. Netscape Navigator 3.0 has the advantage in operating system support and, with about 80 percent of the market, in sheer momentum.

Although betas, the programs we looked at were solid, reliable, and for the most part feature-complete. The final products should be ready by the time you read this, but each program is available as a free download as we go to press.

What sets these fourth-generation browsers apart from their predecessors of the last five years is their emphasis on graphics, multimedia, interactivity, and customizability. Much of what used to be handled by outside applications is now integrated, resulting in quicker and more intuitive navigation of an increasingly visual Web. For example, both IE and Navigator have integrated video playback into the browser itself, so there's less reliance on helper apps and plug-ins. Each browser adds a just-in-time (JIT) Java compiler to speed execution and some collaboration features.

There are sure to be further skirmishes between Microsoft and Netscape in the future, but on the browser front it is now a battle between equals.

INTERNET EXPLORER 3.0

The beta 2 version of Microsoft Internet Explorer 3.0 catches up with Netscape Navigator in performance, customizability, and security, then takes the lead with its slick interface.

Many of IE's most spectacular multimedia and automation features—such as support for MPEG-1 video and ActiveX controls to display editable OLE objects—are available through third-party plug-ins for Navigator. But Microsoft has integrated these features into IE. Entirely new features, with no counterpart in Navigator, include support for ratings of Web page content, file authentication via code signatures that let software publishers guarantee the fidelity of downloaded files, and an extensive array of keyboard shortcuts.

With its JIT compiler, and support for Java applets and JavaScript, IE is now on a par with Navigator. The difference is that IE adds further automation and interactivity through ActiveX (formerly .OCX) controls and ActiveX scripting, but it doesn't support Netscape's LiveConnect specification.

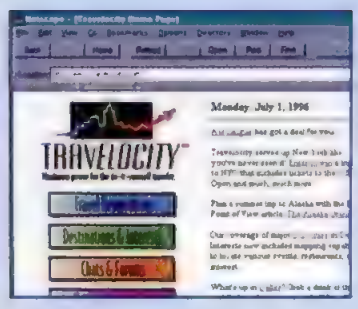
The center of attention is IE's jazzy interface, which includes a toolbar that can be reduced to pictures-only (but not text-only as in Navigator), an address bar, and a bar of link buttons that can be customized to include your favorite sites. Corporate managers can customize these links throughout entire sites and prevent them from being changed by users; Navigator requires an add-on package to do this.

Bandwidth-constrained IE users can trade graphics for speed by turning off the downloading of graphics, but the program doesn't provide anything like Navigator's one-keystroke shortcut for loading current-page graphics. On the other hand, with graphics switched on in IE, you can press the keyboard's Down Arrow while a page is loading and the browser will display text first, followed by graphics. Navigator only loads graphics and text in the order they appear in the original file.

Other IE interface enhancements include a toolbar button and menu option that lets you customize font sizes on the fly, as well as a long-awaited keyboard interface for tabbing through links and form fields; hitting the Tab key in Navigator moves you only through form fields.

Our favorite time-saver is IE's ability to remember and enter

IN THIS EDITION OF FIRST LOOKS



◀ **WEB WORLDS:** Don't leave home without surfing them. Travel-related sites help you plan trips and even book reservations. See page 52.

WINDOWS 95 SPEED DEMONS: ▶ New PCs based on Cyrix's 6x86 P200+ processor push the envelope for Windows performance. See page 50 for reviews.

ALR Revolution Quad6 42
HP NetServer LX Pro 42
Adobe Premiere 4.2 48
Strata MediaPaint 48
Backstage Enterprise Studio 58
Web.Max 58
Kodak DC20 Camera 60
MacOpener 2.0 60
CardWizard Pro for Windows 95 63
Pinnacle 10Xtreme 63
CDM-4000 CD System 66
SmartSound for Multimedia 66

passwords for individual Web sites. At the other extreme, IE's Find dialog box is a time-waster, because you have to close it before you can scroll through the browser window. By contrast, Navigator's Find dialog box can be left open while navigating the browser itself.

There are IE versions for Windows 95 and Windows NT already, and Windows 3.x and Macintosh programs are on the way, but Microsoft is a step behind Netscape's near-complete coverage of desktop operating systems. Microsoft is currently working on a Unix version of IE but will likely not match Netscape's rumored upcoming OS/2 browser.

Unlike Navigator, which uses a single-file bookmark list, IE integrates itself closely into Windows 95 by using Windows Internet Shortcuts to store your favorite sites individually. The next version of IE, which is expected before the end of the year, will likely let you browse your PC's hard disk by using the same interface that you use when browsing the Web.

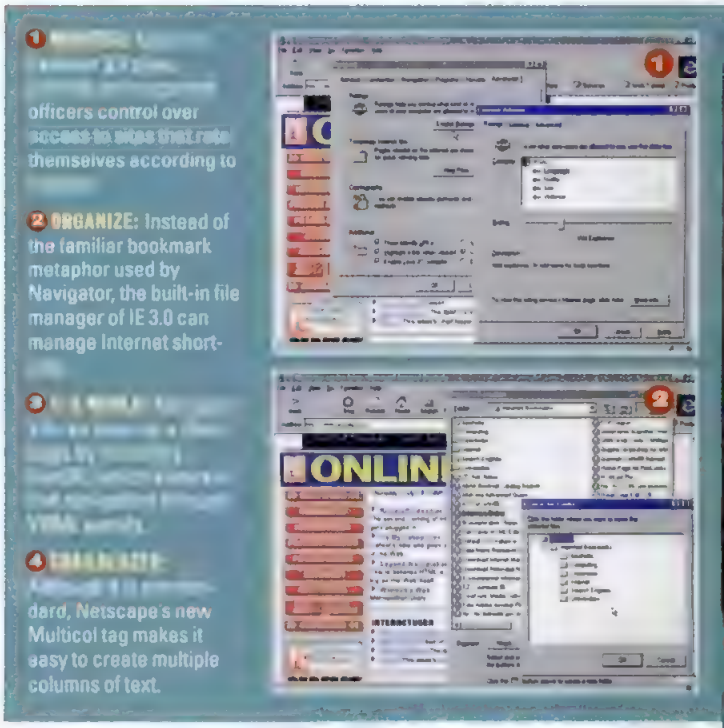
Both browsers make use of a JIT compiler, and the two have been playing leapfrog in terms of Java performance. As we went to press, IE had a slight advantage, but we view this rapidly evolving area as a standoff between the two browsers. The key point is that the incorporation of JIT compilers accelerates local execution of Java applets.

Microsoft's ActiveX technology gives IE a potential advantage over Navigator. With ActiveX, IE can be integrated with applications on your PC's hard disk, and ActiveX can draw on a huge base of .OCX controls; the danger is that ActiveX is so closely tied to Windows that many third-party developers will ignore ActiveX in favor of Java and other platform-independent tools.

Microsoft's ActiveMovie module is one of the slickest parts of IE. It includes software viewers for a wide assortment of audio and video formats, and it can even use your PC's hardware MPEG-1 accelerator. On the other hand, IE's support for Navigator plug-ins remains less than perfect. We found that the browser worked with many of the most popular ones, including Shockwave, RealAudio, and Acrobat, and Microsoft has been adding support for others on a daily basis.

Internet Explorer's parental controls set the standard for locking out objectionable material both for children (by parents) and for office workers (by MIS administrators). There's support for the voluntary PICS (Platform for Internet Content Specification) and RSAC (Recreational Software Advisory Council) content-rating systems. You can also block IE from displaying any pages that haven't been rated, although this blocks access to Microsoft's own Web site as well.

At the time of testing, IE's mail client and newsreader were on the program's menu, but according to Microsoft they will be toolbar items in the shipping version. Both look better and are easier to use than Navigator's equivalent features, which appear to have been warmed over from Version 2.0. For example, IE's newsreader can download and combine multipart news postings. But unlike Navigator's, it won't display images progressively. IE's mail client supports automated filing rules and has a better address book than Navigator's. Downloading files is easier than in IE 2.0, but the process is still complicated and unpredictable compared with Navigator's.



Internet Explorer feels solid and reliable, performs at top speed, and includes significant conveniences and features that haven't reached Navigator—yet.

NAVIGATOR 3.0

The beta 5 Version of Netscape Navigator 3.0 that we tested offers a host of substantive advances over Navigator 2.0, and today it is more of a match for IE than a clearly superior product. It's not that Netscape developers made any major missteps with Version 3.0, it's just that Microsoft has closed the gap between them with IE 3.0.

Major enhancements include the use of Borland's JIT Java compiler, built-in support for a wide variety of multimedia files, and significant extensions to HTML that allow designers greater control over page layout and appearance. Additionally, Netscape has extended JavaScript and its LiveConnect technology, which lets Java applets, plug-ins, and JavaScript scripts communi-

Dogyears.com

Four generations of Web browser technology explained

First wave

1991
Line Mode Browser
The first method of linked Web browsing; limited to character representation of information.

1992
Lynx
A character-based program with linking for use with Unix or VMS systems.

1993
NCSA Mosaic
A high-performance program for retrieving text and executing simple links.

Second wave

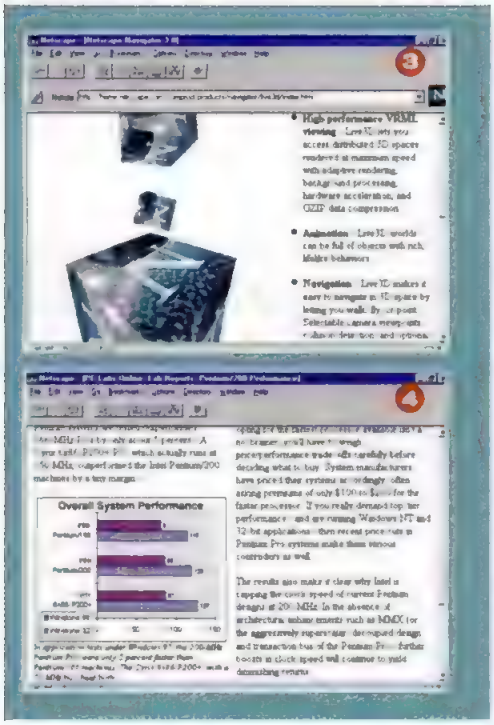
1994
Navigator 1.1
The introduction of progressive rendering and data caching to speed the flow of graphics.

Third wave

1995
Navigator 2.0 and Internet Explorer 2.0
Support for Navigator Plug-ins, caching control, tags for frames, and Java.

Fourth wave

1996
Navigator 3.0 and Internet Explorer 3.0
Better Java support, as well as a variety of multimedia types and complex style sheets.



cate with and control one another. Netscape has also enhanced the browser's ancillary features, providing real-time voice conversations and data collaboration through its CoolTalk applet.

Navigator's elegant user interface is unchanged. Although longtime Navigator users will feel right at home, Version 3.0 looks and feels stale in comparison with IE. Navigator also makes no pretense of integrating into the operating system, a goal that IE is inching toward.

Netscape's relative openness to operating systems—at least in comparison with Microsoft—has helped Navigator maintain a lead when it comes to cross-platform support. Netscape continues to go a step beyond Microsoft by offering Navigator Gold, which permits WYSIWYG editing of Web pages. Enhancements in this version include support for table creation and a one-button upload feature, but Navigator Gold doesn't support all the HTML features that the browser can render; it can't create or edit frames or multicolumn text, for example.

Netscape pioneered the ability to stock a Web page with a rich assortment of content through its Navigator Plug-in architecture, the early adoption of Java, and the development of JavaScript. Navigator's JIT Java compiler provides dramatic performance improvements that are on a par with the IE compiler's.

JavaScript extensions in Navigator include support for JavaScript evaluation. This addition makes it easier to create custom or changeable HTML pages and lets Web authors embed JavaScript expressions in HTML text—a more compact and intuitive notation than previously possible. And JavaScript can now control Java applets and plug-ins, provided that the plug-ins have been recompiled using the LiveConnect SDK.

LIGHTS, CAMERA, ACTION

Navigator covers the gamut of Web-based multimedia: LiveVideo for .AVI movie files, LiveAudio for audio files, and Live3D for VRML (virtual reality modeling language) files, but it neglects support for the MPEG-1 format. Because these players are part of the standard browser, you don't have to fuss with locating, downloading, and installing player modules.

Navigator does not provide native support for ActiveX controls, although NCompass Labs (*www.ncompasslabs.com*) provides a modicum of ActiveX support. Navigator also does not support Microsoft's VBScript.

When it comes to HTML extensions, Netscape has embraced the bulk of Microsoft-defined features—and has introduced some of its own. Navigator supports borderless frames and background colors for table cells and the Font Face tag, which lets HTML authors specify a sequence of preferred typefaces rather than simply accept the user's default preference. The program ignores static background images (watermarks), which are supported in IE.

Breaking new ground, Navigator's HTML tags also include Multicol, which automatically breaks text into multiple columns (either fixed- or variable-width) with adjustable gutters. A Spacing tag provides a mechanism for forcing a particular amount of space between objects, including words and lines. We expect that experienced HTML authors will quickly learn how to get the most out of these features, but these new tags don't provide as much flexibility as the CSS (Cascading Style Sheets) Level 1 specification that Microsoft endorses.

Microsoft says it will only use features endorsed by HTML-standards organizations. Some of IE's unique HTML features—such as support for the CSS specification—represent tentative proposals rather than approved standards. The bottom line is that the two companies finally understand that Web masters and users don't like HTML features that can't be viewed without the right browser.

Navigator 3.0 adds a CoolTalk client, which allows live collaboration over the Internet via audio or a shared whiteboard and is easy to use; neither feature, however, supports multipoint conferencing or application sharing—both of which are included in IE's NetMeeting. Though we applaud the inclusion of CoolTalk, it's hard to imagine its being a must-use component as it now stands.

Netscape Navigator 3.0 represents a major step forward compared with Version 2.0. But it lags behind Microsoft in such areas as style sheets, ActiveX support, and price. In addition, its interface seems a touch stodgy today.

WEB WINDOWS SHOPPING

Although Microsoft is on the offensive with IE's interface, stability, and price, don't count Navigator out yet. The all-important battle of features remains a virtual tie, and Navigator continues to provide more complete platform support and has the momentum of the market behind it.

Regardless of which of these browsers you choose, you'll get a dependable, powerful, and personable companion for your Web journeys.

Microsoft Internet Explorer 3.0. List price: Free. Requires: 6MB RAM, 5MB hard disk space, Microsoft Windows 95 or Windows NT. Microsoft Corp., Redmond WA; 800-426-9400; www.microsoft.com/ie. *Circle 432 on reader service card.*

Netscape Navigator 3.0. List price: $49. Requires: 4MB RAM (8MB recommended), 6MB hard disk space, Microsoft Windows 3.*x*, Windows 95, or Windows NT, Unix or Macintosh OS. Netscape Communications Corp., Mountain View, CA; 415-937-2555; www.home.netscape.com. *Circle 433 on reader service card.*

How the Web Browsers Stack Up

	Microsoft Internet Explorer 3.0	Netscape Navigator 3.0
Controls based on voluntary content ratings	■	
In-line JavaScript evaluation		■
Just-in-time Java compiler	■	■
Loads only current-page graphics		■
Password memory	■	
Scripting languages	JavaScript, VBScript	JavaScript
Style/layout extensions	CSS Level 1 style sheets	Proprietary HTML extensions including multicolumn text
Supports ActiveX controls	■	Via add-on

SERVERS

ALR, HP Debut Quad Pentium Pro Servers

By Carol Venezia

Since Intel's announcement of a server version of the Pentium Pro several months ago, the world has eagerly awaited systems utilizing this powerful processor. The 166- and 200-MHz CPUs with 512K of on-board external cache promised to deliver enterprise-class application server performance at a fraction of the cost of RISC boxes from the likes of Digital, Silicon Graphics, Sun, and others. Two of the first quad Pentium Pro servers, ALR's $34,400 Revolution Quad6 and HP's $35,115 NetServer LX Pro, show the potential of mating a quartet of Pentium Pro CPUs with Microsoft Windows NT.

The first to market with a quad Pentium Pro server, ALR began shipping machines in April. It was able to do this because it designs and builds its own motherboards. Other vendors, including HP, were waiting for Intel to release its quad-Pro motherboard.

LOOK AND FEEL

These two servers may be based on similar components on the inside, but on the outside they're very different animals. The HP NetServer looks like a grown-up version of its Pentium-based NetServer cousins. The case is still wide and sits low to the ground, but it is significantly larger. This added bulk is needed to accommodate its components and to ensure proper airflow for its four Pentium Pro CPUs, which generate much more heat than Pentium processors.

On the front of the NetServer's case, you'll find keyboard and system locks, and a digital panel that indicates hard disk access, power supply status, and fan status. The housing also features 4 5.25-inch drive bays, a 3.5-inch bay for a floppy disk drive, as well as 12 hot-swappable 5.25-inch half-height drive bays. These bays are split into two groups of 6 (concealed behind lockable front panels), so that, in conjunction with the system's dual on-board Fast/Wide SCSI-2 adapters, you can easily duplex the NetServer's disk subsystem.

All drives are easily removable with the flip of a tab, but the housing must be unlocked or, as we discovered, the tabs can easily break off. Each bay is also outfitted with drive indicator lights, so you can see at a glance whether a disk is operational, even with the front panels locked.

SERVER STATS: *ALR's InforManager LCD panel displays a wealth of up-to-the-minute information on the system.*

On the back of the NetServer's case, in addition to serial, parallel, VGA, and SCSI-out ports, you'll find one of this machine's most intriguing features: a trio of hot-swappable, redundant, 790-watt power supplies. Each power supply features a status light and lock, as well as a large handle for easy hot-swapping.

The Quad6's slate-gray case features ALR's InforManager, a touch-screen LCD control panel that provides up-to-the-minute information on the CPU, disk and system fan activity, CPU and system temperatures, power supply status, and system voltage. This information can also be monitored through software under Windows NT.

The Quad6's case has storage space to spare: There are 13 storage bays—2 3.5-inch half-height and 11 5.25-inch half-height. To facilitate data storage, ALR offers a Quick Hot Swap kit. The kit's hot-swappable backplane design can accommodate up to three hard disks; five kits can be installed per system (our test unit had four). Unlike the NetServer, the Quad6 doesn't have individual drive status lights; one light serves as the indicator for your entire disk array. All drive bays, as well as the power switch and system reset button, are concealed behind two lockable front panels.

The Quad6's rear panel has two high-speed serial ports (16550 UART); parallel, serial, and mouse ports; and memory fault and power-supply alarm-reset buttons. The system also features two redundant 575-watt power supplies.

Although designed very differently, these quad Pentium Pro servers were easy to get into, and there's plenty of room to move around once you're inside. The NetServer's innards are easily accessed by loosening two thumbscrews and removing the system's top cover. On the underside of the top cover, you'll find a handy Service Reference Label with step-by-step troubleshooting instructions.

Removing the top cover reveals the unit's uncluttered motherboard. Processors are located on drop-in cards (two 166-MHz Pentium Pro CPUs per card), as is system ECC memory, which is expandable to 2GB total. All three cards slide easily in and out of their slots on guide rails. The motherboard, CPU, and memory cards are all built for HP by Intel. The NetServer's motherboard features Intel's Orion core-logic chip set, six PCI expansion slots, four EISA slots, and two Adaptec 7880 Fast/Wide SCSI-2 host adapters.

The interior of the Quad6 is also quite easy to access by removing three thumbscrews from its lockable side panel. Like the NetServer, the Quad6 has a detailed road map inside its case cover, but with a motherboard diagram and a guide to jumper-switch setting, as well as memory configuration guidelines.

Like the NetServer, the Quad6 utilizes Intel's Orion chip set. Unlike HP's implementation, all four CPUs and CPU voltage regulators are seated directly on the motherboard; standard ECC memory, however, is located on an add-in card and is expandable to 2GB.

The Quad6's expansion potential is highly impressive: The system board features seven PCI slots, one shared EISA/PCI slot, and seven EISA slots. The motherboard can support CPU speeds in excess of 300 MHz.

PRO PERFORMANCE

We gauged the performance of both systems with our ServerBench, Version 3.0, and NetBench, Version 4.01, benchmark tests. The former test measures application functions, while the latter measures file and print functions. Together, they represent a good measure of a server's performance potential.

We tested both servers on a 60-client Ethernet network, with one, two, and four processors. Both servers were equipped with four 10/100-Mbps Fast Ethernet adapters, and we tested both under Windows NT Server, Version 3.51, with 256MB of RAM and nine 2GB Fast/Wide SCSI-2 hard disks.

Under NetBench, the HP unit

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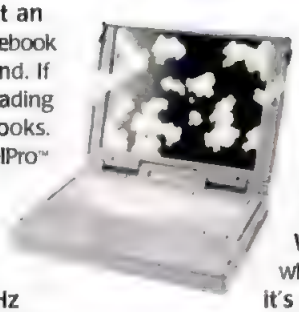

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CIRCLE 235 ON READER SERVICE CARD

beat out ALR's entry at virtually all levels of testing. In fact, the throughput levels achieved by the NetServer with only two CPUs were higher than the Quad6's with four CPUs. Because NetBench generates a significant amount of network traffic, each server's NICs likely contributed heavily to performance results.

Under ServerBench, the numbers are somewhat different: Testing with one CPU, the two machines performed alike. With two CPUs, they ran neck-and-neck up to 30 clients; as more clients were added, the NetServer pulled away and, with a full 60-client load, finished on top. With four CPUs, under light client loads, the Quad6 was the better performer, but its throughput levels dropped like a rock with more than 20 clients. With a 60-client load, the NetServer's throughput bested the Quad6's by nearly 60 percent.

HP took the lead in server management as well. The NetServer comes with HP's NetServer Navigator CD, which, through its Information and Configuration assistants, helps you to install and configure your choice of NOS and access online documentation and troubleshooting guides. You can use these tools to track network activity locally or use HP's OpenView program to manage your WAN. HP also sells a Remote Assistant EISA board ($900) for remote, out-of-band management.

PRO POWER: *The NetServer has more than enough muscle to serve as an enterprise-class application server.*

In addition to InforManager, ALR offers its server management software, NetTune, Version, 1.20. With NetTune, the network administrator can configure up to 32 servers from one client workstation, as well as configure NetWare SET parameters and view real-time charts of CPU utilization, network packet transmittal activity, disk activity, and network connection status. Out-of-band management support is currently not available.

Both of these machines offer the levels of performance, fault tolerance, and security features expected from an enterprise-class application server. But if you're looking for that extra bit of performance, as well as a mature management solution and top-notch support, HP is the way to go.

—Mark Stanczak contributed to this report.

Revolution Quad6. List price: With 4 166-MHz Pentium Pro CPUs, 256MB ECC memory, 9 2GB hard disks, Mylex DAC960P RAID controller, 4 Cogent EM 110 TX Fast Ethernet adapters, $34,400. Advanced Logic Research Inc., Irvine, CA; 800-444-4257, 714-581-6770; www.alr.com. *Circle 428 on reader service card.*

NetServer LX Pro. List price: With 4 166-MHz Pentium Pro CPUs, 256MB ECC memory, 9 2GB hard disks, 4 Intel EtherExpress PRO/100 PCI Fast Ethernet adapters, $35,115. Hewlett-Packard Co., Santa Clara, CA; 800-322-4772; www.hp.com. *Circle 429 on reader service card.*

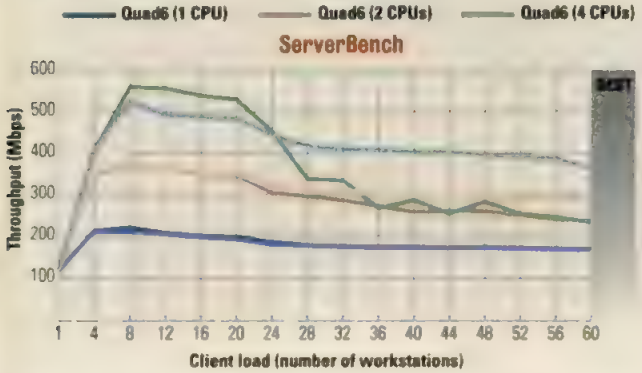
BENCHMARK TESTS

Quad Pentium Pro Servers

To gauge the performance of the ALR Revolution Quad6 and the HP NetServer LX Pro, we tested using ZD ServerBench, Version 3.0, and ZD NetBench, Version 4.01. ServerBench measures application functions, and NetBench focuses on file and print tasks.

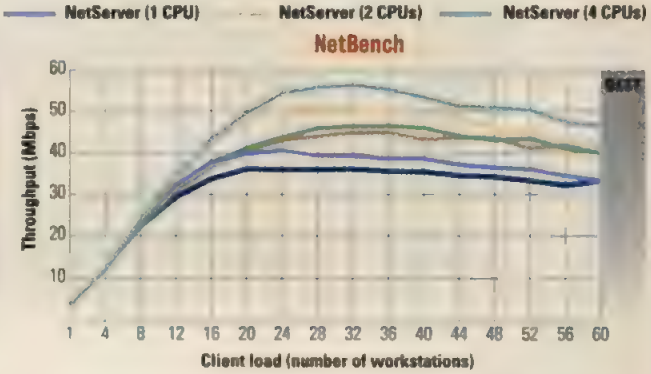
On ServerBench tests with one Pentium Pro CPU, the two systems were roughly equivalent in terms of throughput. But with multiple CPUs, as we increased the client load, the NetServer excelled. With four CPUs and a 60-client load, the NetServer surpassed the Quad6's throughput by 57 percent.

The NetServer dominated the NetBench tests as well. At all levels of testing (one, two, and four CPUs), the NetServer outperformed the Quad6 on print- and file-sharing chores. With two CPUs, the NetServer achieved slightly higher throughput than the Quad6 with four CPUs.



We tested both servers on a 60-client Ethernet network, with one, two, and four processors. Both servers were equipped with four 10/100-Mbps Fast Ethernet adapters. The NetServer used HP-licensed Intel EtherExpress PRO/100 PCI NICs, and the Quad6 employed Cogent EM 110 TX PCI NICs.

For **ServerBench** testing, we split our 60-node test network into four 15-client segments, using Bay Networks' 28115 Fast Ethernet switches set to operate at 10 Mbps as the network backbone. For **NetBench** testing, we split the network into two 30-client segments and set the switches for 100-Mbps operation.



We tested both servers under Microsoft Windows NT Server, Version 3.51, with 256MB of RAM and nine 2GB hard disks. One disk for each server was used as the system boot volume, while the remaining eight disks were configured in a RAID Level 0 array. Both machines used Seagate Barracuda Fast/Wide SCSI-2 hard disks. The NetServer's array was configured through software using the system's integrated Adaptec SCSI channels, and the Quad6 employed a Mylex DAC960P three-channel bus-mastering RAID controller with 4MB of cache memory.

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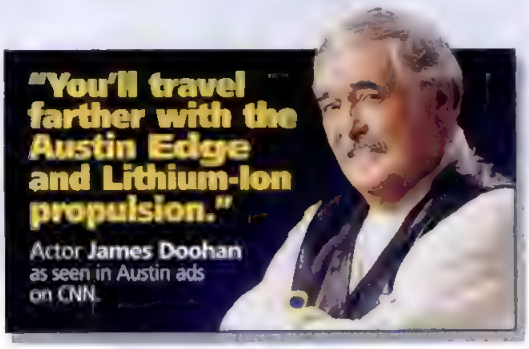

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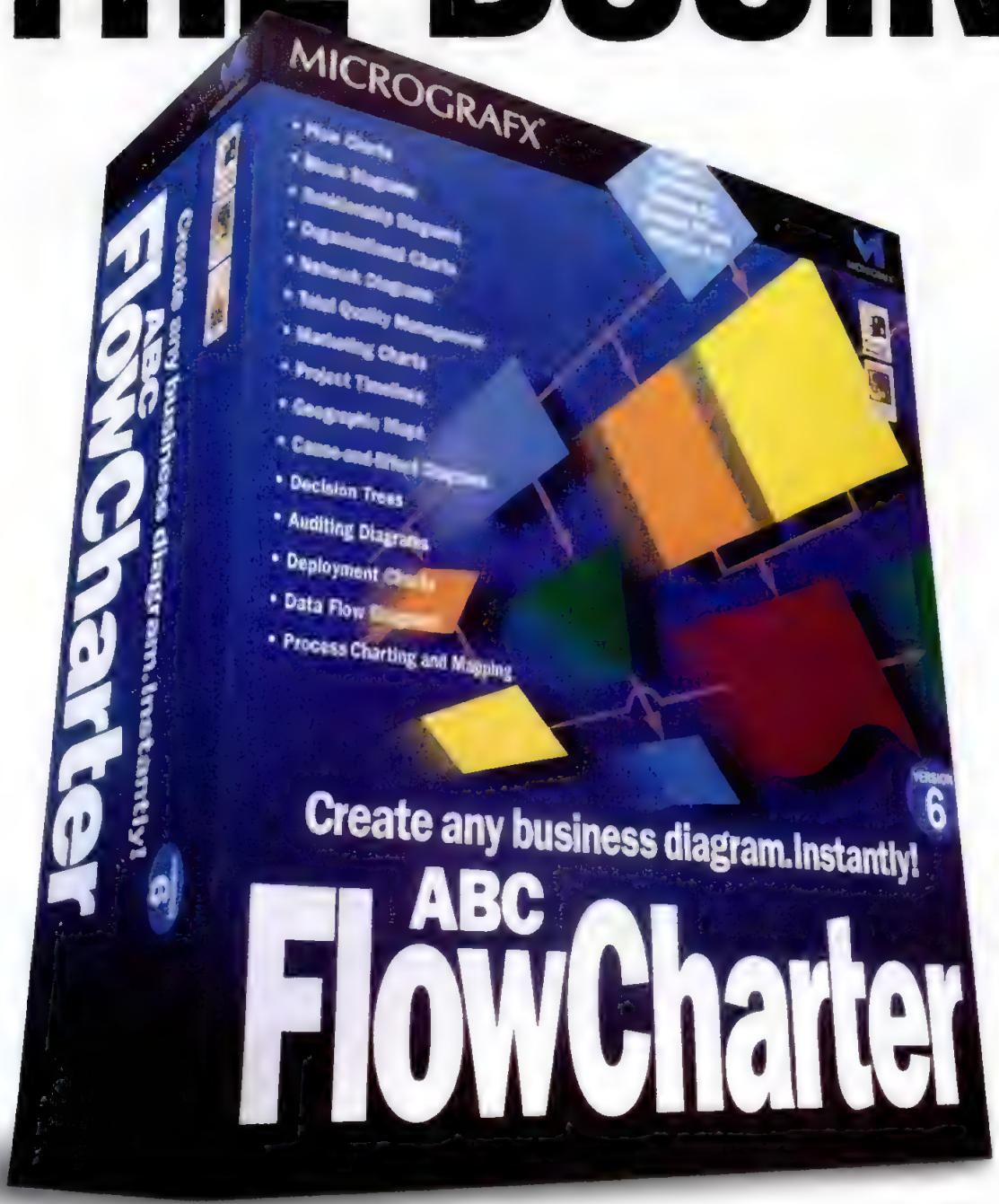

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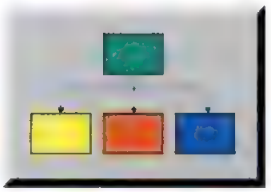
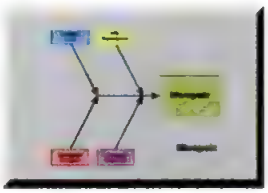
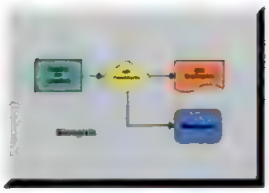


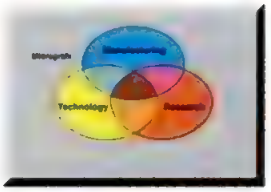
Human resource tools like organization charts and relationship diagrams



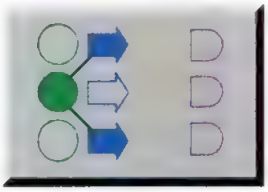
Management support diagrams like cause & effect, decision trees and timelines



Business process re-engineering diagrams like flow charts and data flow diagrams



Marketing tools like venn diagrams, targets, pyramids and geographic diagrams



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DIGITAL VIDEO

Whether for TV, Tape, or the Web, Premiere Speeds Up Editing

By Luisa Simone

Using Adobe Premiere, the leading PC video editing program, has always meant compromising speed for precision. Instead of adding a slew of extra features, the $798 Adobe Premiere, Version 4.2, focuses on supporting Intel's Indeo Interactive, improving performance, and boosting the quality of the video the program produces.

First and foremost, Version 4.2 has been optimized for the 32-bit world of Microsoft Windows 95 and Windows NT, and our testing shows that this version runs about 40 percent faster than the 16-bit version (First Looks, March 14, 1995). Not only was response faster, but running under Windows NT shaved a few critical seconds off preview and compilation times.

Because Premiere can use Intel's Indeo Interactive Codec, we were able to optimize the output video for a variety of outlets: games development, CD delivery, and streaming video over the Internet. By choosing options within the compression settings dialog box, you can create videos with a transparency channel, user defined locations for keyframes, and local windows (or viewports) into a larger source video. For example, the transparency option enabled us to use a video clip as an animation sprite that was overlaid onto a background clip.

DESKTOP, GAMER, OR WEBMASTER: *Support of the Indeo Interactive Codec allows Adobe Premiere to enhance digital video for games, CDs, and the Internet.*

Other Premiere options include noise reduction, gamma correction, deinterlacing, and cropping. These production-oriented filters can be applied to single clips or to a group of clips in a movie on a global basis. We found that the noise reduction filter effectively eliminated randomly colored pixels that interfere with efficient compression.

Premiere contains five new filters that supplement the already extensive collection of special effects. While the Camera View filter (which lets you pan, zoom, and roll around a clip in simulated 3-D space) is immediately useful, others, like the Lens Distortion filter (which curves and bends clips into unusual shapes) have more limited applications.

Premiere's CD-ROM contains several useful add-ons: Crystal Flying Fonts 3.0.1 LE, for generating spectacularly fluid titling effects, and the VDOLive Codec and Personal Web Server, so that you can stream your video over the Internet. Version 4.2 also includes an Adobe sampler with Adobe Photoshop LE, Adobe Type Library, and Adobe Type Manager.

Rather than pilling on a multitude of features, Adobe Premiere, Version 4.2, makes the most of Indeo Interactive and adds a major performance boost.

Adobe Premiere, Version 4.2. List price: $795. Requires: 8MB RAM (16MB for Windows NT), 10MB hard disk space, Microsoft Windows 95 or Windows NT. Adobe Systems Inc., Mountain View, CA; 800-833-6687, 415-961-4400; www.adobe.com. *Circle 407 on reader service card.*

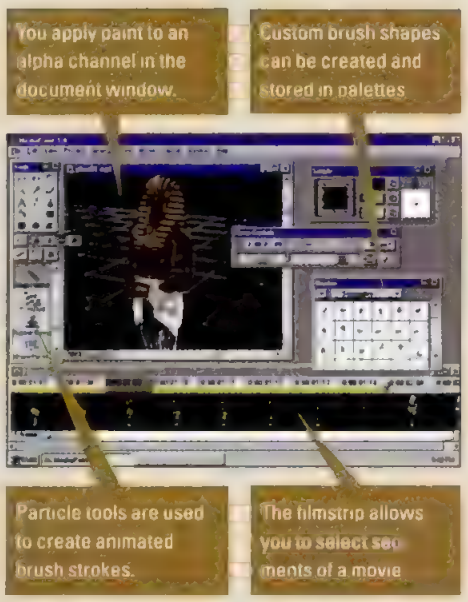
MediaPaint Makes Movie Magic

Strata's MediaPaint 1.0 is a video painting program that replaces the tedious and frustrating practice of hand-editing rotoscoped special effects with nearly complete automation of the process. The beauty of MediaPaint is that you can use standard raster paint tools (such as a brush, an airbrush, or dodge and burn tools) to transform a single-frame painting into an animated painting sequence.

With MediaPaint, you can work in either of two ways. After you're done painting frame number one, you can copy your changes to the next frame and continue through the sequence. Or you can choose to have the program smoothly interpolate a brush stroke over a series of video frames.

LOTS O' WINDOWS: *MediaPaint requires you to navigate several different palettes and to work with multiple views of a document.*

MediaPaint breaks new ground with its Particle Tools, which are self-animating brushes that can produce dynamically variable effects over time. There are four Particle tools that are implemented as plug-ins: Baby Boom, Pixie Dust, Spin Out, and Squiggle. Much of MediaPaint's power derives from its unique interface, which is divided into the movie layer, the paint layer, and the stencil layer. Because changes are applied exclusively to the paint layer, the integrity of the source video is preserved. Even MediaPaint's stencil layer is stored in a buffer, which can be displayed in a filmstrip window. MediaPaint's magic is that although the movie and paint layers are separate, they are presented to the user as they would appear in final video form.



Because MediaPaint maintains an alpha channel for the paint layer and a chroma-keyed mask channel for the stencil layer, it can be resource-intensive. The lack of TIFF import and export is a serious omission, as is the absence of an option for QuickTime for Windows output.

MediaPaint's specialized functions make it a powerful complement to traditional video editing programs.—*LS*

MediaPaint 1.0. List price: $695. Requires: 8MB RAM, 20MB hard disk space, Microsoft Windows 95 or Windows NT. Strata Inc., St. George, UT; 800-787-2823, 801-628-5218; www.strata3d.com. *Circle 408 on reader service card.*

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- Microsoft Home Pak includes: Works 4.0 for Windows 95; Publisher Deluxe for Windows 95; Encarta 96; Encarta 96 World Atlas; Music Central 96; Wine Guide; Arcade 1.0; Scenes—Sports Extremes Collection; Cinemania 96; Julia Child Home Cooking; Best of Windows Entertainment Pack; CD Sampler (including Fury³ game demo)
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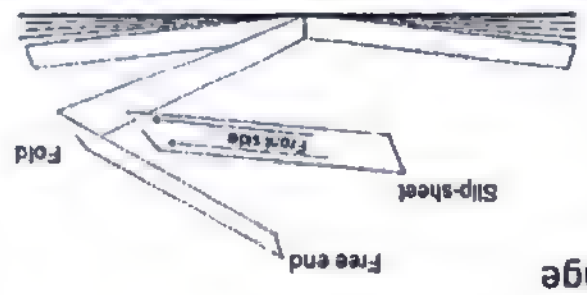

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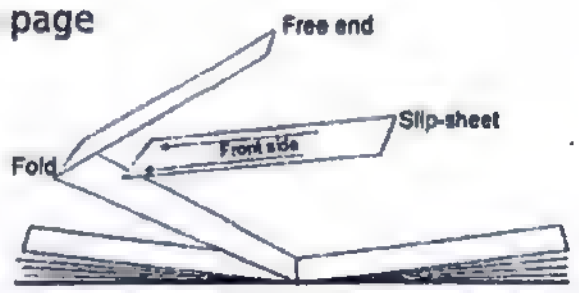

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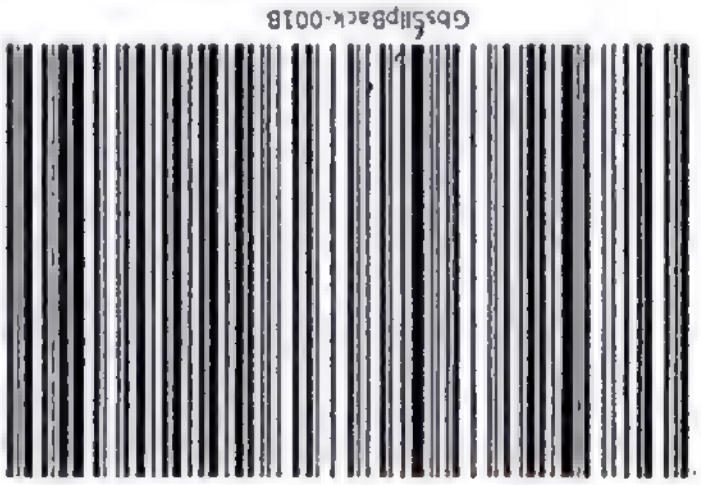

Back

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Inverted Back

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SUPERIOR SOLUTIONS BY DESIGN

Any PC maker can claim to offer a solution that covers your needs. But at Micron™ Electronics, we prefer to let our history and our products speak for themselves. We think you'll agree it's an impressive story.

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In the past two years, leading industry publications have applauded Micron PCs with more than 140 awards for product performance, customer service and support. This includes *PC Magazine*'s Best Products of 1995 and Editors' Choice awards in several categories. Add more than 40 *PC World* Best Buy awards and you've got an impressive technology hall of fame. In fact, just this summer, Micron has won three *PC Magazine* Editors' Choice Awards for Millennia desktop and Millennia TransPort notebook computers—an unprecedented achievement for Micron.

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After your purchase, the story continues. Just ask *PC Magazine* readers. They bestowed on us the coveted Readers' Choice for Customer Service and Reliability in 1994 and 1995. And *PC World* recently awarded us first tier status along with the likes of Apple, Compaq, Digital and HP. Pretty good company, wouldn't you say?

RELIABILITY RANKING

1ST TIER

APPLE COMPAQ MICRON DIGITAL

2ND TIER

AST NEC

3RD TIER

ACER

Source: *PC World* Reliability & Service Monitor, May 20 - November 20, 1995

Micron Power℠ Warranty*—An Industry First

We support our reliability promise with the industry-leading Micron Power warranty. It backs the microprocessor and main memory for five years, an industry first. Add a three-year, parts-only system warranty and a 30-day money-back guarantee, and you can rest assured that you're in good hands.

Millennia TransPort™ P133

- 133MHz Mobile Intel Pentium® processor
- Intel 430MX PCI chipset
- 256KB L2 pipeline burst cache
- 16MB EDO memory (48MB max.)
- 8X modular CD-ROM drive
- PCI graphics accelerator, 1MB EDO memory
- Pick-a-Point™ dual pointing devices integrate both pointing stick and touchpad
- Removable EIDE hard drive (1.2GB max.)
- 3.5" modular floppy drive
- Intelligent modular lithium-ion battery
- 16-bit stereo sound
- Built-in stereo speakers and microphone
- 2 Type II or one Type III PCMCIA slots
- S-Video and NTSC video-outputs
- Headphone, microphone and line-in jacks
- 2 infrared ports, one front, one back
- Parallel, serial, VGA and 2 PS/2 ports
- Dimensions: 11.7" x 9.4" x 2.0", Weight: 6.9 lbs.†
- Samsonite® nylon carrying case
- Microsoft® Windows® 95 and MS® Plus! CD
- Microsoft Office Pro 95 and Bookshelf® 95 CDs
- Kensington™ security lock††
- 5-year/3-year Micron Power™ limited warranty*

† 6.9 lbs. includes 3.5" floppy and one battery
†† Lock secures both Millennia TransPort and MicroDock

- 16MB EDO memory (48MB max.)
- 12.1" active matrix display, 800 x 600
- 1.2GB removable hard drive

$4,399 Business lease $150/month

- 32MB EDO memory (48MB max.)
- Motorola® Montana 28.8 fax/modem
- 12.1" active matrix color display, 800 x 600
- 1.2GB removable hard drive
- 2nd lithium-ion battery

$5,199 Business lease $163/month

Options

- With 150MHz Pentium processor ..... add $200
- With Motorola Montana 28.8 fax/modem..... add $299
- With 3Com® Ethernet 10BT PCMCIA ..... add $149
- With Samsonite® leather carrying case ..... add $99
- With 2nd modular Lithium-ion battery ..... add $199
- With 2nd 1.2GB hard drive..... add $599
- With 2nd 2.0GB hard drive..... add $699
- With 16MB DIMM module upgrade. ..... add $349
- With 32MB DIMM module upgrade. ..... add $749

PC Magazine Editors' Choice
August 1996
Millennia TransPort P133

PowerServer SMP P133

- Intel 133MHz Pentium processor
- Dual Pentium SMP ZIF sockets
- 512KB write-back cache, flash BIOS
- Slots: 5 EISA, 2 PCI, 1 EISA/PCI
- PCI 32-bit Ultra SCSI Fast-20 controller
- 8X SCSI-2 CD-ROM drive, 3.5" floppy drive
- PCI 64-bit video, MPEG, 2MB EDO
- Full-size tower with 10 drive bays
- Microsoft® Mouse, 104-key keyboard
- Microsoft Windows® 95 & MS® Plus! CD
- 5-year/3-year Micron Power™ warranty*

- 16MB RAM • 1GB SCSI-2 hard drive
- 15" Micron 15FGx, .28dp (13.7" display)

$2,499 Business lease $84/month

- 32MB RAM • 2GB SCSI-2 hard drive
- 15" Micron 15FGx, .28dp (13.7" display)

$3,099 Business lease $105/month

- With second 133MHz Pentium processor.....add $299
- With Windows NT™ Workstation.....add $99

PowerServer SMP P266

- Dual 133MHz Pentium processors
- 512KB write-back cache, flash BIOS
- Slots: 5 EISA, 2 PCI, 1 EISA/PCI
- PCI 32-bit Ultra SCSI Fast-20 controller
- 8X SCSI-2 CD-ROM drive, 3.5" floppy drive
- PCI 64-bit video, MPEG, 2MB EDO
- Full-size tower with 10 drive bays
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows NT Workstation
- 5-year/3-year Micron Power warranty*

- 32MB RAM • 2GB SCSI-2 hard drive
- 15" Micron 15FGx, .28dp (13.7" display)

$3,499 Business lease $119/month

- 64MB RAM • 4GB SCSI-2 hard drive
- 17" Micron 17FGx, .26dp (15.8" display)

$4,549 Business lease $155/month

intel inside
pentium PROCESSOR

Millennia Pro200

- Intel 200MHz Pentium Pro processor
- 256KB internal cache, flash BIOS
- 8X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- PCI 64-bit 3D video, MPEG, 4MB EDO
- Tool-free minitower or desktop
- Microsoft® Mouse, 104-key keyboard
- Microsoft Windows NT™ Workstation CD or Windows® 95 & MS® Plus! CD
- 5-year/3-year Micron Power warranty*

- 16MB EDO RAM • 1.2GB EIDE hard drive
- 15" Micron 15FGx, .28dp (13.7" display)
- Microsoft Works 95 CD

$2,399 Business lease $82/month

- 32MB EDO RAM • 2.1GB EIDE hard drive
- 17" Micron 17FGx, .26dp (15.8" display)
- Microsoft Office Pro 95 & Bookshelf® 95 CDs

$3,049 Business lease $104/month

Millennia Pro200 Plus

- Intel 200MHz Pentium Pro processor
- 256KB internal cache, flash BIOS
- PCI 32-bit Ultra SCSI Fast-20 controller
- 8X SCSI CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- PCI 64-bit 3D video, MPEG, 4MB EDO
- Tool-free mini-tower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows NT™ Workstation CD or Windows 95 & MS Plus! CD
- Microsoft Office Pro 95 & Bookshelf 95 CDs
- 5-year/3-year Micron Power warranty*

- 32MB EDO RAM • 2GB Fast SCSI-2 hard drive
- 15" Micron 15FGx, .28dp (13.7" display)

$3,499 Business lease $119/month

- 64MB EDO RAM • 4GB Fast SCSI-2 hard drive
- 17" Micron 17FGx, .26dp (15.8" display)

$4,549 Business lease $155/month

- 128MB EDO RAM • 9GB Fast SCSI-2 hard drive
- 21" Micron 21FGx, .26dp (20.0" display)

$7,649 Business lease $240/month

ClientPro™ P100

- Intel 100MHz Pentium processor
- 256KB pipeline burst cache, flash BIOS
- 3Com 3C509 Combo network adapter
- 3.5" floppy drive
- Tool-free minitower or desktop
- Microsoft® Mouse, 104-key keyboard
- Microsoft DOS 6.22/Windows® for Workgroups 3.11
- 5-year/3-year Micron Power™ warranty*

- PCI 64-bit graphics accelerator (2MB EDO)
- 8MB EDO RAM • 1.2GB EIDE hard drive
- 14" Micron 14FGx, .28dp (12.9" display)
- Microsoft Works preinstalled

$1,499 Business lease $51/month

- PCI 64-bit graphics accelerator (2MB EDO)
- 16MB EDO RAM • 2.1GB EIDE hard drive
- 15" Micron 15FGx, .28dp (13.7" display)
- Microsoft Office Pro 4.3 preinstalled

$2,018 Business lease $69/month

- With 133MHz Pentium processor.....add $100

ClientPro P200

- Intel 200MHz Pentium processor
- 256KB pipeline burst cache, flash BIOS
- 3Com 3C509 Combo network adapter
- 32MB EDO RAM • 3.1GB EIDE hard drive
- 3.5" floppy drive
- 8X EIDE CD-ROM drive
- PCI 64-bit graphics accelerator (2MB EDO)
- 17" Micron 17FGx, .26dp (15.8" display)
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows NT™ Workstation
- Microsoft Office Pro 95 & Bookshelf® 95 CDs
- 5-year/3-year Micron Power warranty*

$3,257 Business lease $111/month

- With 166MHz Pentium processor....subtract $100

intel inside
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Custom configure your new Micron™ system with our most popular options.

Multimedia Options

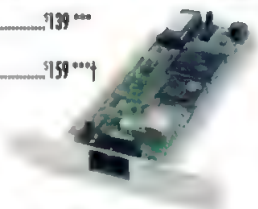
- 16-bit 3D Wavetable stereo sound $59*
- 16-bit 3D Wavetable stereo soundcard w/2MB RAM $99*
- Advent AV270 Powered Partners stereo speakers $99
- Advent AV370 Powered Partners stereo speakers w/subwoofer $199
- Microsoft® SideWinder™ 3D Pro joystick $59

Storage/Media Options

- Adaptec 2940U Ultra SCSI Fast-20 controller $100
  (upgrade from system with standard Ultra SCSI Fast-20 controller)
- Plextor 8Plex 8X 1.2MB/S SCSI internal CD-ROM drive ..... $200 **
  (upgrade from systems with standard 8X EIDE CD-ROM drive)
- Iomega SCSI Jaz drive with 1.0GB removable cartridge ..... $399 **
- Iomega Zip IDE drive with 100MB removable cartridge $99
- Iomega Ditto 800 (400/800MB) Travan Tape back up w/tape $149
- Iomega Ditto 3200 (1.6/3.2GB) Travan Tape back up w/tape $199
- Sony 4/8GB DDS-2 DAT SCSI Tape back up w/tape ..... $999 **

Communication Options

- 28.8bd V.34 internal data/fax modem ..... $139 ***
- 28.8bd V.34 internal telephony data/fax modem w/full duplex speakerphone and voice mail ..... $159 ***†



Networking Options

- 3Com® 3C509 Ethernet ISA NIC (BNC, AUI & RJ-45) $99
- 3Com 3C595 Fast Etherlink PCI 10/100 NIC (RJ-45 only) $159
- SMC ISA TokenCard network card $199

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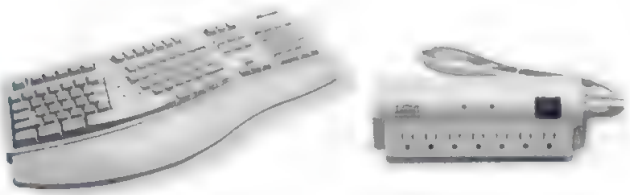
- Quicken Financial Pak, including: Quicken Deluxe 5.0; Quicken Financial Planner™; Quicken Parents' Guide to Money™; Quicken Family Lawyer™ $69

Display/Video Options

- 17" Hitachi SuperScan 1711 (15.9" display) .26dp color monitor ..... $150 ††
- 21" Hitachi SuperScan 2111 (20" display) .26dp color monitor ..... $1,050 ††
- Diamond Stealth64 video card w/2MB VRAM ..... $150 †††
- Diamond Stealth64 video card w/4MB VRAM ..... $300 †††
- #9 Imagine 128 series II video card w/4MB VRAM ..... $500 †††
- #9 Imagine 128 series I video card w/8MB VRAM ..... $750 †††

Other Options

- APC Per7T surge suppressor $39
- APC Pro7T surge suppressor $59
- Microsoft Natural Keyboard® $49
  (upgrade from standard keyboard)



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** Requires SCSI Host Adapter
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† Requires sound card
†† Upgrade from systems with standard Micron 17" 17FGx color monitor
††† Upgrade from systems with standard 64-bit 2MB video card

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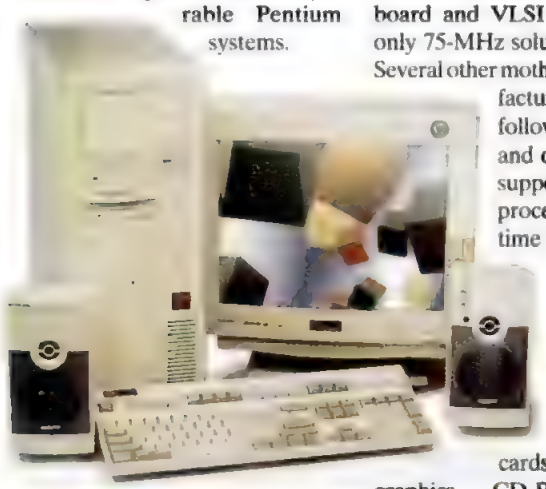
DESKTOP PCs

Fasten Your Seat Belts: Cyrix P200+ Systems Are Ready for Blast-Off

By John Morris

If you crave the ultimate in high-performance computing, the latest Cyrix 6x86–based systems could be just what you're looking for. Simply put, these first PCs based on Cyrix's 150-MHz 6x86 P200+ CPU achieved the best overall Winstone scores under Microsoft Windows 95 that we've seen to date. And they do so at prices that are competitive with comparable Pentium systems.



POLY PERIPHERALS: *The Poly P200Cx boasts a 10X CD-ROM drive and 128-bit graphics card.*

These systems achieve their stratospheric performance levels by combining Cyrix's capable 150-MHz 6x86 P200+ processor with a breakthrough 75-MHz system bus design and such high-performance subsystems as swift SCSI-based hard disk controllers. Put it all together and you've got a system capable of speeding past 200-MHz Pentium PCs (First Looks, July, 1996) without looking back.

NEW SPEED LIMIT: 75 MHZ

These P200+ PCs are the first desktop systems to incorporate a system bus capable of operating at 75 MHz. By contrast, Pentium-based PCs use either a 60- or 66-MHz system bus, depending on the processor's internal clock speed. This 12 percent speed difference helps alleviate some of the bottlenecks we observed in Pentium/200 PCs. Intel is expected to have 75-MHz system bus support but not until the end of the year.

We tested the first three P200+ systems available: the Cyrix 6x86-P200, the Poly P200Cx, and the Sys Performance C200+. All three systems used the same DFI motherboard and VLSI chip set—the only 75-MHz solution available. Several other motherboard manufacturers promise to follow DFI's lead and offer parts that support the P200+ processor by the time you read this.

In addition to offering peak performance, these three systems came loaded with sound cards, high-end graphics, CD-ROM drives, adapters, and speakers. The Poly P200Cx and the Sys Performance C200+ included 17-inch monitors, while the Cyrix system got by with a 15-inch monitor.

The P200+ systems performed best on our pair of Winstone benchmark tests, which are suites of applications designed to simulate everyday use. On our 16-bit Winstone 96 tests, the Sys Performance C200+ performed 10 percent better than the average Pentium/200 system; the margin was slightly more pronounced on our 32-bit Winstone 32 benchmark tests.

The results of our other tests were a mixed bag. The Poly P200Cx, which had the group's best score of 37.6 million pixels per second on our Graphics WinMark 96 tests, was slightly ahead of the average for Pentium/200 PCs. On the other hand, these 6x86 P200+ systems couldn't keep up with Pentium/200 systems on our CPU benchmark tests. But what the P200+ systems lacked in raw processor power, they more than made up for in excellent system design and individual component performance.

As was the case when we looked at Pentium/200 PCs, Sys Technology is the company to beat in terms of performance. The Sys Performance C200+ notched the best benchmark test scores among P200+ systems in nearly every category, and at $3,545, it packs a lot of value.

When you put all the pieces together, these P200+ systems offer a win-win situation. They are the fastest Windows 95 machines available today, they don't sacrifice anything, and they give Intel a run for the money.

CYRIX 6x86-P200

Seeking to draw attention to its 6x86 processors, Cyrix introduced its own line of PCs earlier this year. Its flagship model, the Cyrix 6x86-P200, comes in three basic configurations. We tested a $3,399 system that included an Adaptec Fast/Wide SCSI-2 hard disk controller.

The Cyrix 6x86-P200 was not the fastest system in the group—though it was competitive with the average of Pentium/200-based systems. It was, however, definitely the best looking. The handsome mini-tower case has emerald green accents and is decorated with a pattern of diamonds. On the back panel, the printer and serial ports, and keyboard and mouse inputs, are clearly labeled. Inside the case, cables are neatly bundled, providing easy access to the Cyrix 6x86-P200's SIMM and expansion slots (three ISA, three PCI, and one shared connector).

The Cyrix 6x86-P200 we tested came equipped with 16MB of RAM, 256K of pipelined-burst external cache (the smallest of the group), and a 4GB Seagate Barracuda hard disk (the largest by far of the group). Our test unit had a Matrox MGA Millennium graphics card with 2MB of WRAM and a MagInnovision 15-inch monitor.

Of the three systems, the Cyrix 6x86-P200 is the best choice for multimedia tasks. The test configuration included a 32-bit Sound Blaster audio card and Labtec speakers with a separate subwoofer unit. Along with the expected headphone jack, and volume, bass, and treble controls, the unit includes a mute button. Cyrix rounded the system out with an 8X CD-ROM drive and a V.34 data/fax modem that can send and receive at 28.8 Kbps.

On our benchmark tests, the Cyrix 6x86-P200 lagged behind the other two P200+ systems (which had the advantage of twice the external cache). But its scores were better than the average of the five Pentium/200 PC we've tested. The high points were its solid showings on the Graphics WinMark 96 and CD-ROM WinMark 96 tests, which were counter-balanced, ironically for a processor maker, by the systems low CPUmark scores.

CYRIX INSIDE. . .AND OUTSIDE: *Inside Cyrix's great-looking mini-tower case is the company's fastest 6x86 processor.*

PHOTOGRAPHS BY THOM O'CONNOR

The Cyrix 6x86-P200 is an excellent overall system that trades a little performance for multimedia glitz.

Cyrix 6x86-P200. List price: With P200+ CPU, 16MB RAM, 256K external cache, 4GB hard disk, 8X CD-ROM, 15-inch monitor, $3,399. Cyrix Corp., Richardson, TX; 800-340-7501, 214-968-8388; www.cyrix.com. *Circle 409 on reader service card.*

POLYWELL POLY P200Cx

The Poly P200Cx, from Polywell, splits the difference between the other two systems in terms of performance, and at $3,155, it is also the least expensive system in this group.

The Poly P200Cx was the only full-size tower configuration we tested in this group. But since all three systems use the same motherboard, the larger case won't buy you any more expansion possibilities inside; there's room for three ISA, three PCI, and one shared slot. The system has one additional half-height external bay, however, for a 3.5-inch device.

The Poly P200Cx is one of the first systems we've seen with Pinnacle Micro's new 10X CD-ROM drive (see our First Looks review on page 63). Surprisingly, the system's CD-ROM WinMark 96 score was last in the group.

The system we tested was equipped with 16MB of EDO RAM, 512K of pipelined-burst external cache, and a 2GB Quantum Atlas hard drive with an Adaptec Fast/Wide SCSI-2 controller. To complete the package, Polywell added a Sampo 17-inch monitor, 16-bit Sound Blaster card, 15-watt stereo speakers, and a Logitech Mouse Man.

With its 128-bit STB Lightspeed graphics adapter, which is based on Tseng's ET6000 graphics accelerator, and 2MB of DRAM, the Poly P200Cx pulled away from the pack on our Graphics WinMark test with a score of 37.6 million pixels per second. On most other tests, the system was solidly middle-of-the-road with Winstone 32 and Winstone 96 scores of 113 and 87, respectively.

Despite its lackluster CD-ROM performance, the Poly P200Cx offers leading edge graphics performance at a competitive price.

Poly P200Cx. List price: With P200+ CPU, 16MB EDO RAM, 512K external cache, 2GB hard disk, 17-inch monitor, $3,155. Polywell Computers Inc., San Francisco, CA; 800-999-1278, 415-583-7222; www.polywell.com. *Circle 410 on reader service card.*

SYS PERFORMANCE C200+

Sys Technology continues to do the near-impossible with its Sys Performance C200+ PC. The system is nothing short of the fastest Windows 95 system available today. At $3,545, it's the most expensive system in the group, but it's reasonably priced considering what you get.

Surprisingly, the Sys Performance C200+ doesn't sacrifice any of the features found in its competitors to achieve this new price/performance milestone. In fact, the system included the best monitor in the group: a 17-inch MagInnovision, boosted by a Matrox MGA Millennium graphics adapter with 2MB of WRAM.

The system we tested was equipped with 16MB of EDO RAM, 512K of pipelined-burst external cache, and a Seagate 2GB hard disk with an Adaptec Fast/Wide SCSI-2 connector. Inside the mini-tower case there are three PCI and three ISA slots, plus a shared connector.

Sys Technology topped the system off with a Toshiba 8X CD-ROM drive, Cardinal V.34 data/fax modem, and a 16-bit Sound Blaster sound card. Like many low-end desktop stereo speakers, the included MLi 65 speakers were barely adequate and didn't include a mute button.

WINSTONE WARRIOR: *The Sys Performance C200+ offers the best Windows 95 performance we've seen.*

The Sys Performance C200+ is a Winstone warrior. Its Winstone 96 and Winstone 32 scores of 89 and 114, respectively, set new standards for this class of computers. And it garnered the best Disk WinMark 96 and CD-ROM WinMark 96 scores among P200+ PCs. Though its CPU benchmark test scores were the highest among the group we tested, the Sys Performance C200+ still couldn't match Pentium/200-based PCs in this category—a pattern we've seen throughout our testing.

If you feel the need for speed, the Sys Performance C200+ delivers the maximum Windows 95 performance; it's the PC to beat.

Sys Performance C200+. List price: With P200+ CPU, 16MB EDO RAM, 512K external cache, 2GB hard disk, 17-inch monitor, $3,545. Sys Technology Inc., Cypress, CA; 800-613-9963, 714-821-3900; www.systechnology.com. *Circle 411 on reader service card.*

FIRST LOOKS PLUS

From August 19 to 23, go online to discuss 6x86-based PCs with reviewer John Morris and representatives from Cyrix, Polywell, and Sys Technology. Type GO EDITOR on CompuServe.

BENCHMARK TESTS

P200+ PCs

With the fastest 6x86 processor ever, a 75-MHz system bus, and other high-end goodies, these P200+ PCs set a new standard for Microsoft Windows 95 performance. In particular, this group excelled on our Winstone tests but lagged on our CPU tests. The performance leader was Sys Technology's Sys Performance C200+, which posted a Winstone 96 score of 89. Its Winstone 32 score of 114 was 10 to 15 percent better than those of the Pentium/200-based PCs we've seen (First Looks, July 1996).

To measure performance under Windows 95, we used ZD Winstone 96, Version 1.0; ZD Winstone 32, Version 1.0; and ZD WinBench 96, Version 1.0. Each system was equipped with 16MB of RAM and ran Windows 95.

Higher scores represent better performance

Bold type denotes first place among products reviewed

	ZD Winstone 96	ZD Winstone 32	ZD Graphics WinMark 96	ZD Disk WinMark 96	ZD CPUmark$_{16}$	ZD CPUmark$_{32}$	ZD CD-ROM WinMark 96
Cyrix 6x86-P200	83	110	34.1	1,240	325	325	665
Polywell Poly P200Cx	87	113	**37.6**	1,250	332	343	580
Sys Performance C200+	**89**	**114**	34.3	**1,300**	**348**	**360**	**684**
Average Pentium/200 (First Looks, 7/96)	81	101	36.0	1,142	361	371	736

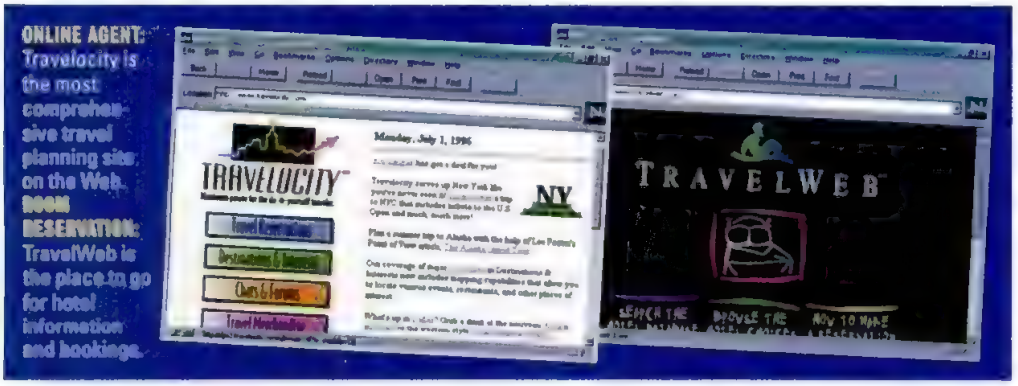
WEB ROUNDUP

It's A Small Web After All: Travel Sites Bring the World to Your PC

By Melissa J. Perenson

There's good news and bad news for travelers when it comes to the World Wide Web. If you're trying to research vacation destinations, you'll find a plethora of sites. If, however, you're planning a business trip, using the Web can be more frustrating than fruitful.

One reason is that travel sites tend to be inconsistent in terms of the depth and accuracy of city-specific content. Maybe the local phone number is missing, or there's only information about lodgings and nothing about area attractions. Speed is another issue: You may have to drill through five or more levels to get to the information you want.



When it comes to online airplane reservations, there are several sites providing schedule and fare information (as well as overnight ticket delivery and discounts for booking over the Internet); but if you already know which airline you want to fly, you'll make better time using an airline's toll-free phone number. Many of the major international airlines, hotels, and car rental companies are on the Web, offering schedule and booking information as well as online reservations.

It still has a way to go, but the Web can be a good starting place when you're planning a journey. In fact, you can find valuable morsels online that you may not get from a tourist office or travel agent. But don't toss away that pocket-size vacation guide just yet.

TRAVELOCITY

Brought to you by Sabre Interactive and Worldview Systems, an established provider of travel content, Travelocity (*www.travelocity.com*) is the most comprehensive travel site on the Web. You can make your flight reservations using Sabre's system, research your destination, compare notes with other travelers, and purchase travel accessories, all under one roof. The site supports Netscape Navigator's Secure Socket Layer (SSL) encryption for transactions. Car rental and hotel reservations are due to be added later this year.

You can conduct searches based on either your destination or your interests, or search across the site by keyword. There are 18 categories, ranging from business and lodging to children's interests, museums, and restaurants. The destination information is best for big cities; smaller cities and towns may have nothing more than one or two lodging listings. The category-specific contents are also inconsistent and far from complete. For example, Hong Kong is a major business center, but the only business resources listed are nine trade organizations.

TRAVELWEB

An outstanding site for making hotel reservations, TravelWeb (*www.travelweb.com*) has listings for over 8,000 hotels worldwide, including 47 major and mid-size chains. The site, published by the Pegasus lodging consortium, benefits from focusing on only hotel reservations. Locating the right hotel is easy thanks to TravelWeb's attractive and easy-to-navigate interface.

You can search the hotel database by city, hotel chain, type of accommodation (suite, bed and breakfast, hotel, or conference center), and rate. Particularly notable is the ability to search on desired amenities. There are 38 options you can specify, including rooms with modem lines, no smoking designations, and such hotel facilities as business centers and health clubs. Hotel descriptions are detailed and complete, with currency and contact information clearly labeled, and loads of specifics about facilities.

About 60 percent of the hotels listed participate in TravelWeb's online reservations service, which uses Netscape's SSL encryption for transactions. Making a reservation is simple, and you receive confirmation by e-mail.

OTHER TRAVEL-RELATED SITES

Anyone who's ever fumbled with a subway map can appreciate **The Subway Navigator** (*metro.jussieu.fr:10001*), which features comprehensive subway guides for 61 cities ranging from Calcutta to Caracas (including 10 U.S. cities). Simply enter your starting point and destination and The Subway Navigator provides you with a suggested route and tells how long the trip takes.

If you're looking for a quick, hassle-free way to check airfares, then **Instant Air** is for you. Part of the Global Online Traveler site (*www.got.com*), Instant Air lives up to its name. Based on the Apollo flight reservation system, Instant Air performs real-time schedule and fare queries.

Drawing on the content of Fodor's travel book series, the **Fodor's Guide** site (*www.fodors.com*) offers selective restaurant and hotel recommendations, as well as local information, travel tips, and tourist hot spots worldwide. A customizable search field lets you choose criteria with ease, but the site could be more comprehensive.

Offered by QuickATM, which provides the QuickAID airport information directory kiosks found in airports throughout the U.S., **Welcome to QuickAID** (*www.quickaid.com*) is a gold mine for road warriors. The site's well-organized home page provides links to two useful resources: a Traveler's Yellow Pages that lists toll-free phone numbers for airlines, hotels, limousine services, and other travel-related information; and a collection of 29 QuickAID Airport Information Directories, with detailed airport terminal maps, information on airlines and ground transportation, and other basic information.

Metroscope (*metroscope.com*) and **City.Net** (*www.city.net*) are stellar resources if you're looking for links to city-specific travel sites. The well-organized Metroscope features over 5,000 links for 48 U.S. cities and 6 seemingly randomly selected international destinations. Excite's City.Net has a collection of over 2,300 links to local information, searchable by city and regional destination. There's also an excellent collection of city, country, and continent maps.

With all these sites to choose from, the hardest part of your next trip will be deciding where to go.

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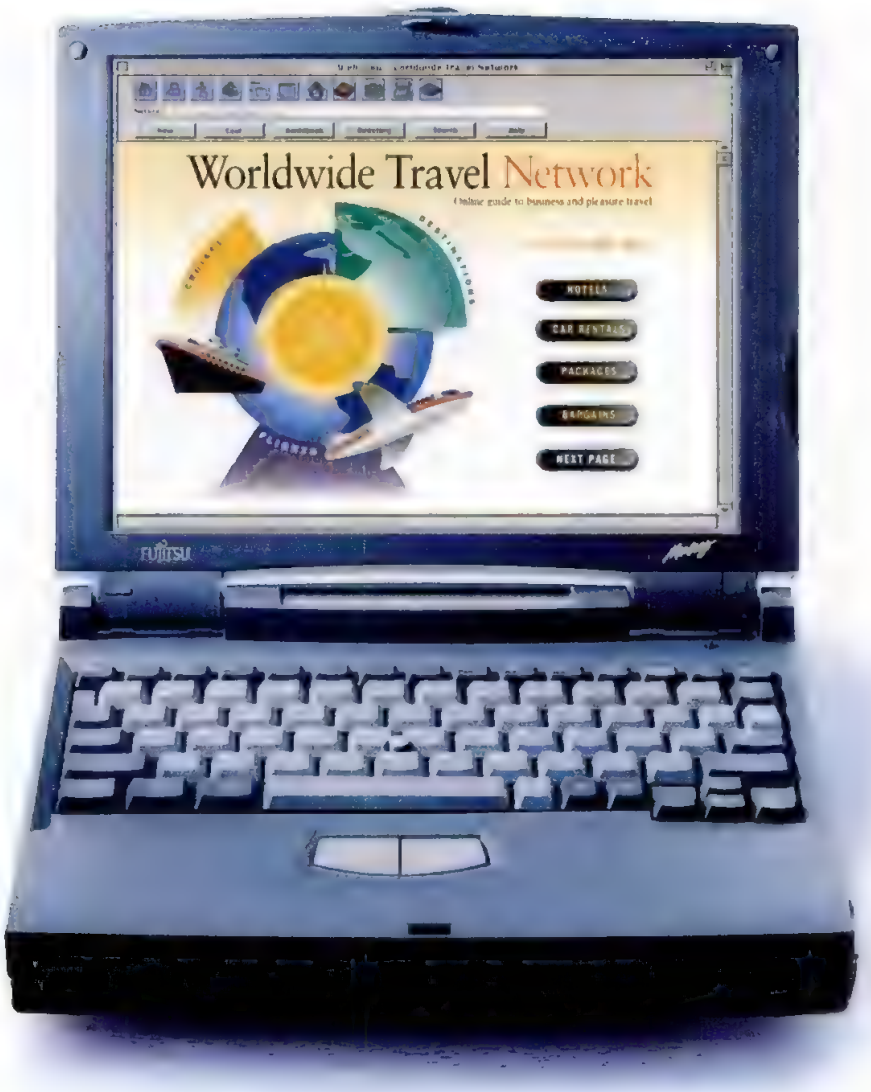

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WEB PROGRAMMING

Macromedia Is Your Backstage Pass to Entertaining Web Pages

By Jay Munro

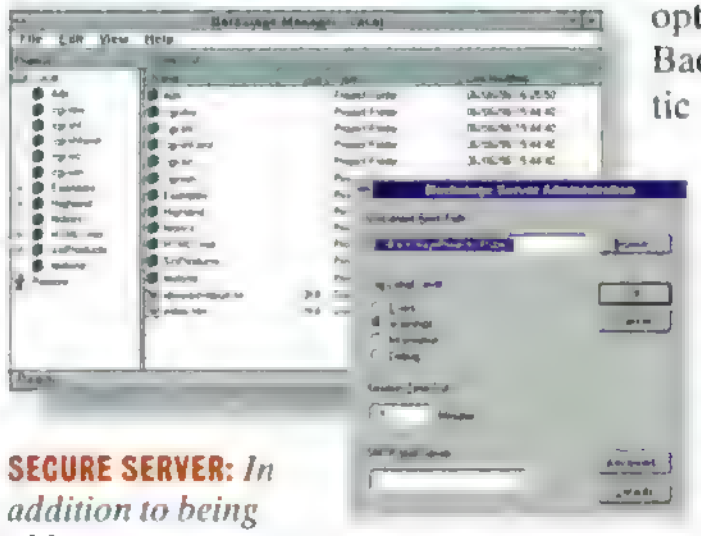
Do you suffer from site envy, the nagging feeling that your Web site is quickly becoming an anachronism? Well, if you host your site on Microsoft Windows 95 or Windows NT 3.51, Macromedia's Backstage Studio can help you to build an interactive and dynamic site with little or no coding.

For this review, we concentrated on the high-end Studio product: Backstage Enterprise Studio ($2,999). Two other Backstage products, Backstage Designer ($79) and Backstage Designer Plus ($99), are authoring environments; the latter program is reviewed in this issue. (See "Web Authoring.")

For those who need more security and transaction handling, or high-end client/server database capability, Backstage Enterprise Studio is the way to go. Setup is easy and well documented. All it requires is basic knowledge of your site's URL structure and SMTP address. For database access, you also need to install the appropriate 32-bit ODBC drivers.

The core of the package's dynamic-page creation features is the Backstage Object Server, a CGI gateway that resides between your Web server and your database. The Object Server handles objects ranging from database access and discussion groups to page-hit counters and data tables. Creating a page using Backstage objects is done by inserting the object and setting attributes and parameters. The Backstage Manager utility provides easy control over Backstage projects.

Normally, the HTTP protocol is a stateless entity; each page hit represents a single and unique event. With Backstage, Macromedia has overcome the stateless problem by storing user profiles, which are validated at logon and retained for the entire user session. You can create and store profiles to screen users and serve up customized HTML pages. Security can be enhanced by setting time-outs and controlling the entry points. Validation can also handle the database logon procedure.



SECURE SERVER: *In addition to being able to store user profiles, you can set session time-outs and control entry points to maintain security.*

Database access is a key component of Backstage. It allows the Webmaster to create pages to read, query, and update ODBC databases. To optimize database access, Backstage uses optimistic locking on database records, which caches data passed to an HTML page rather than actually locking the record. Macromedia claims tested support for Borland dBase 5.5 for both Windows 95 and Windows NT; Microsoft Access 7.0; Microsoft FoxPro 3.0; and Paradox 7 for Windows 95. We did, however, successfully read data from Microsoft SQL Server 6.0 on our Windows NT 3.51 installation.

For intranet users, the Discussion Group Object can reduce mailbox overload with threaded topic support; navigation; filtering by subject, author, or time limit; sorting; and user profile support. The message form includes fields for subject, e-mail address, and a user-elected time limit for posting replies. You can choose whether to post messages as text or in HTML.

To get you up and running quickly, Macromedia supplies a nice selection of demos with samples of discussion groups, queries, database connectivity, authentication, and a complete classified-ad bulletin board, as well as two full sites. You also get over 1,200 JPEG clip-art images and sample Shockwave and Java applets.

Although it is lacking a comprehensive scripting language, Backstage is a terrific all-around site design, maintenance, and deployment environment.

Backstage Enterprise Studio. List price: $2,999. Requires: 16MB RAM, 7MB hard disk space, and Microsoft Windows 95 or Windows NT 3.51. Macromedia, San Francisco, CA; 800-457-1774, 415-252-2000; www.macromedia.com. *Circle 430 on reader service card.*

WEB UTILITIES

Berkeley's Web.Max: Web Surfing for Couch Potatoes

By David Haskin

Vendors are releasing Web utilities so fast it's hard to keep track of them all. But Berkeley System's $39 Web.Max stands out. This wide-ranging set of Web end-user utilities has a warm, snuggly interface that should appeal to Internet newbies who prefer simplicity over power and flexibility.

Web.Max includes applications that gather news and download Web pages for off-line browsing. It includes a universal front end for Web searches, an Internet telephony program, and a security tool, plus some giveaway software. Its primary visual cue is a dog named Max that appears on screen during many operations. These ingratiating programs work well and are easy to use, although none is particularly powerful or offers many configuration options.

GO FETCH: *Net Retriever can search for Web pages, newsgroups, and shareware, and it can even look up addresses for individuals.*

Web.MaxTelevision accesses a variety of news sources—CNN and *USA Today*, for example—and also displays Web-related items such as "cool" site lists. Clicking on a story summary launches your Web browser and loads that page.

Net Retriever is Web.Max's universal front end for Internet searches. Among the items you can search for are Web sites, Usenet newsgroups, stock prices, shareware, and even individuals' addresses. Web.Max Downloader is similar to Freeloader. You tell it what pages to download to your hard drive and when to do so; then you can view the pages off-line. The least powerful of the utilities is Web.Max Phone, an Internet telephony utility. Though simple to set up and use, it supports only half-duplex sound cards.

Web.Max won't appeal to experienced Web hands who want loads of power and flexibility, but Berkeley Systems is betting that cybersurfers will be willing to trade power for convenience.

Web.Max. List price: $39.99. Requires: 8MB RAM, 18MB hard disk space, Microsoft Windows 95. Berkeley Systems, Berkeley, CA; 800-344-5541, ext. 100, 510-540-5535; www.berksys.com. *Circle 431 on reader service card.*

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CIRCLE 254 ON READER SERVICE CARD

DIGITAL CAMERAS

Kodak DC-20: Small, Light, and Basic PC Photography

By Daniel Grotta and Sally Wiener Grotta

Kodak's $350 Digital Science DC-20 filmless camera is the lightest, most compact, and least expensive color digital camera available. Its simple, almost toy-like appearance belies its ability to capture moderately detailed images quickly and easily.

DOG DAY: *The DC-20 is the smallest digital camera on the market, but the images it produces are only adequate.*

The first digital camera that Kodak is targeting for the home, the DC-20 jettisons features from the DC-40 and DC-50 cameras (First Looks, June 13, 1995 and March 12, 1996, respectively). There are only three buttons: Power, Erase, and the shutter release. The camera has a trio of status lights that show Power, Busy, and Memory Full.

Taking pictures is easy: Just turn the power on, line up the subject in the viewfinder, and shoot. There are no LEDs or LCDs to read or decipher, nor is any mode or resolution switching needed. It takes about 5 seconds to reset the camera for the next shot. The only other user-accessible components are the battery compartment for the unit's 3-volt lithium cell and a tiny serial-port plug.

Although there's no built-in flash, the camera's light sensor automatically switches the charge couple device target's light sensitivity to an ASA setting of 800 or 1,600; it also varies the aperture from f4 through f11 and the shutter speed from $^1/_{30}$ to $^1/_{4,000}$ of a second. The result was generally a perfectly exposed frame, although the camera had difficulty adjusting to heavily backlit situations that normally require flash. And twilight scenes tended to be overexposed.

The DC-20 has an automatic white balance for adjusting to the light source (sun, or indoor or fluorescent lighting). But we noticed a significant brown overcast when we went from shooting in sunlight to shooting shadowed subjects.

The DC-20 has no frame counter, but the red Memory Full light blinks once, twice, or three times to alert the user to the number of pictures left. Once the camera is attached to the computer, the user can toggle between standard and high-resolution modes, take pictures, or reprogram how long the camera remains on before going into its battery-saving mode.

The DC-20 comes with 1MB of memory, which was enough to record 8 high-resolution (493- by 373-pixel) images or 16 standard resolution (320- by 240-pixel) images. The amount of data captured in high-resolution mode is 125K, which decompresses to a 1.5MB file. Getting images out of the DC-20 is almost as easy as shooting. The DC-20 comes with cables for both the PC and Macintosh, a Special Fun Edition of PictureWorks' PhotoEnhancer, and an amazing morphing program from MetaTools called Kai's Power Goo. PhotoEnhancer displays as many as eight monochrome thumbnail images, and the default acquisition mode saves the decompressed images as TIFF files. During our evaluation, it took about 27 seconds to acquire each high-resolution image.

Unlike some other filmless cameras, the DC-20 doesn't preserve any shooting data, such as a time/date stamp or exposure information. Quality of the 24-bit images ranged from fair to adequate. Each decompressed high-resolution image displayed on a computer screen expanded to 4.6 by 3.1 inches.

The DC-20's low price tag, ease of use, and family-oriented software package make it a hot consumer item for those willing to live with its technical compromises. **Kodak Digital Science DC-20 Camera.** List price: $350. Requires: 8MB RAM, 1MB hard disk space, Microsoft Windows 3.1 or later, CD-ROM drive, serial port. Eastman Kodak Co., Rochester, NY; 800-235-6325; www.kodak.com. *Circle 401 on reader service card.*

CROSS-PLATFORM UTILITIES

MacOpener 2.0 Reads Mac Disks like a Book

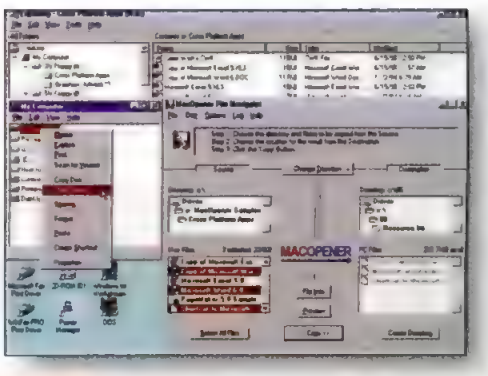
By J.W. Olsen

The $49 MacOpener from DataViz continues to lead its competitors by giving PC users access to a variety of removable Macintosh media.

Like Pacific Micro's Mac-in-DOS Plus, Insignia Solutions' MacDisk, Hypro Technologies' MacAccess, and Software Architects' Here & Now, MacOpener deftly accesses and formats high-density Mac disks. What sets MacOpener apart are its range of supported media, its ability to preview many Mac file formats, and its support for Windows 95 long filenames. MacOpener supports Mac CD-ROMs, Syquest drives, Iomega Bernoulli and Zip drives, Sony rewritable optical drives, and Mac removable hard drives. To read a SCSI drive, the disk must comply with the ASPI standard.

Windows 95 users can access Mac disks in virtually any way they normally access PC disks. Major choices include using the Windows Explorer, right-clicking a drive icon, and using the File|Open menu command. MacOpener's File Navigator interface adds the benefits of a preview and displays details for many file types. But File Navigator is showing its age, most notably because of its lack of drag-and-drop support.

MacOpener, however, remains the product of choice for dependable access to Mac files via the PC.



PC OR MAC? *MacOpener lets you access a Mac disk the way you would a PC disk.*

MacOpener 2.0. Street price: $49. Requires: 4MB RAM, 1MB hard disk space, Microsoft Windows 3.1, Windows 95, or Windows NT. DataViz Inc., Trumbull, CT; 800-733-0030, 203-268-0030; fax, 203-268-4345. *Circle 402 on reader service card.*

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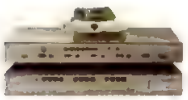

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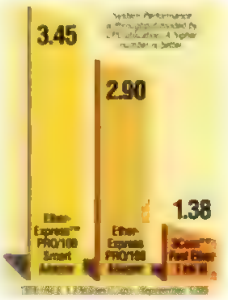

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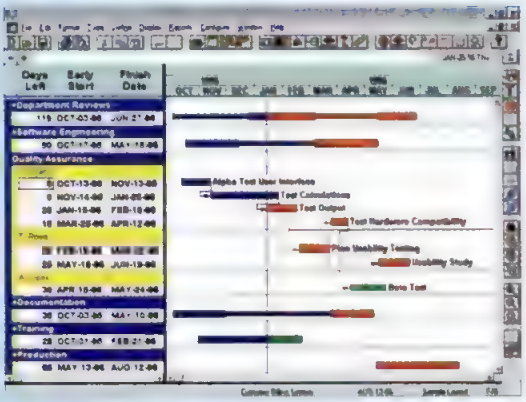

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CIRCLE 148 ON READER SERVICE CARD

NOTEBOOK ACCESSORIES

CardWizard Pro Lets You Plug And Run with Your PC Cards

By Bruce Brown

If you recently bought a notebook computer, chances are that you got SystemSoft's PC Card recognition and configuration software with it. For the upgrade crowd, SystemSoft's $69.95 CardWizard Pro for Windows 95 can save hours of frustration by correctly identifying and setting up a wide variety of PC Card devices.

The retail CardWizard Pro is a step behind the OEM version used by manufacturers. For this review, we looked at Version 1.10.03, which unlike the newest OEM release, doesn't support Zoom Video or 3.3-volt cards.

CardWizard Pro is that rarity of software publishing today: the program that comes on one floppy disk. The program presents a two-tier approach to card recognition. When a new card is inserted into your notebook's PC Card slot, Microsoft Windows 95's native PC Card utility, which was also written by SystemSoft, gets the first shot. If it can't recognize the card, CardWizard Pro takes over.

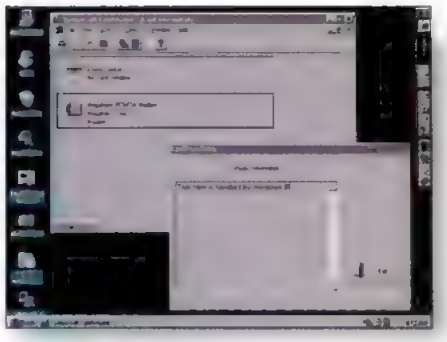
Not only are CardWizard Pro's database and PC Card support broader than what is included with Windows 95, but the program's wizard mode walks you through installation and configuration, saving effort and averting configuration mistakes that could endanger data or a card.

We tested CardWizard Pro with a Dell Latitude XPi notebook and a dozen different PC Cards, including modems, LAN adapters, multifunction cards, SRAM cards, flash memory cards, and ATA hard disk cards. We installed modem and SRAM cards fine without CardWizard Pro, but we couldn't install an AMD Flash RAM card, because that support isn't yet available in CardWizard Pro.

CardWizard Pro did successfully install a Western Digital UltraLite ATA hard disk card that was not recognized by Windows 95. An IBM Home and Away combination modem/LAN adapter card that SystemSoft's wizard mode installed correctly using the proper drivers was recognized as only a modem card by Windows 95.

CardWizard Pro can automatically launch designated applications along with their associated cards. It can, for example, launch your communications program when the modem is inserted and then bring up your groupware product when the LAN card is inserted.

If you regularly deal with a pack of PC Cards, SystemSoft's intelligent program could mean the difference between easy card installation and a hardware nightmare.



SMART CARD: *CardWizard Pro automatically identifies and configures many PC cards, but it lets Windows 95 handle the easy ones.*

CardWizard Pro for Windows 95. List price: $69.95. Requires: 1 PCMCIA Release 2.1 slot, Microsoft Windows 95. SystemSoft Corp., Natick, MA; 800-449-7973; fax, 508-651-8188; www.systemsoft.com. *Circle 403 on reader service card.*

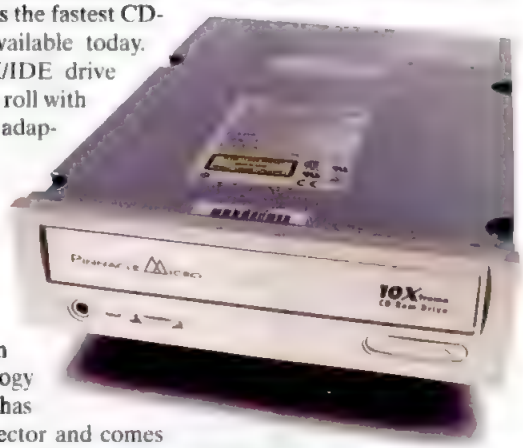
CD-ROM DRIVES

Pinnacle Takes the CD-ROM Lead With the First Ten-Speed Drive

By Alfred Poor

In an era where hard disks routinely transfer four megabytes of data per second, the single-speed CD-ROM drive's throughput of just 150 kilobytes per second seems wimpy. By contrast, Pinnacle Micro's $239 10Xtreme, the first of an expected onslaught of 10X drives, is the fastest CD-ROM drive available today.

This ATAPI/IDE drive comes ready to roll with a 16-bit ISA adapter card from Data Technology Corp. The card has one IDE connector and comes configured as a secondary EIDE channel, but it can be configured to be the primary channel instead.



NEED FOR SPEED: *Pinnacle Micro's CD-ROM drive, 10Xtreme, moves a lot of data quickly.*

The half-height 10Xtreme drive fits in any 5.25-inch bay and doesn't use a caddy to hold the CD in place. The manual provides clear instructions and step-by-step set-up photographs. The jumper switches on the back of the drive for master/slave configuration are fairly well marked and easy to set correctly.

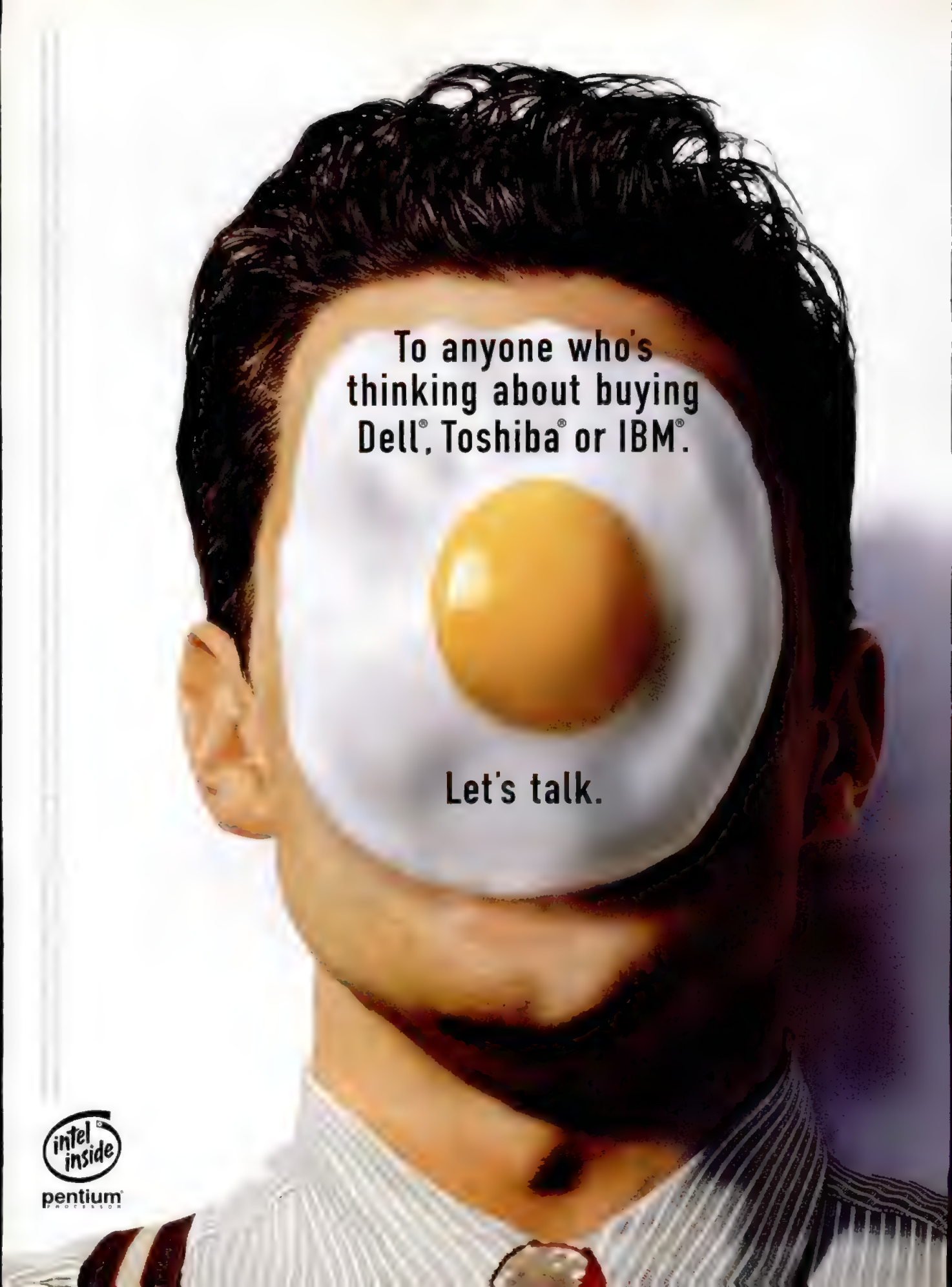
The 10Xtreme package includes software for use with both DOS and Windows 3.*x*, but the unit also configured itself correctly under Windows 95. The 10Xtreme comes with a program that measures the drive's sequential data transfer rate and average seek time. There's also a copy of UP, a multimedia CD containing 100 motivational clips that you can configure to run as a screen saver or to play a clip each time you start up your computer.

The video clips on the UP CD—as well as those on other multimedia titles—played smoothly on the 10Xtreme drive with only an occasional dropped frame. We got the best results for sequential reads—1,390 Kbps—on the ZD CD-ROM WinMark 96 benchmark test. These results consistently fell short of the drive's 1,500 Kbps specification for a 10X drive, and its access time was a slow 228 milliseconds.

Is there any benefit from this extra speed? The same video clips that ran smoothly on the 10Xtreme played just as well on a 6X drive and on many quad-speed drives we used for comparison, because most of today's CD titles are engineered to be played back on a double-speed CD-ROM drive. The 10Xtreme's forte is heavy data lifting. The areas where it shines are in installing megasoftware programs, searching large text databases on CD-ROMs, and loading large graphic files. For example, a 15MB file that took 25 seconds to come up on screen with a quad-speed drive loaded in just 10 seconds with the 10Xtreme.

At $239, the 10Xtreme is not the cheapest CD-ROM drive you can get. But it is the fastest.

10Xtreme. List price: $239. Requires: PC with open ISA slot or open EIDE connector. Pinnacle Micro Inc., Irvine, CA; 800-553-7070, 714-789-3000; www.pinnaclemicro.com. *Circle 404 on reader service card.*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Let's talk.
intel inside
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CIRCLE 122 ON READER SERVICE CARD

MULTIMEDIA

DynaTek's CDM-4000 Makes Mastering CDs a Snap

By Jon Hill

Take one Yamaha CDR-100 recorder, add a Plextor 4X CD-ROM reader and a 1GB SCSI hard disk, throw in a customized version of Elektroson's Gear recording software and you've got DynaTek's $3,600 CDM-4000 Quad-Speed CD Mastering System. The external unit, roughly a 9-inch cube, handles standard CD recording tasks with aplomb and does something that no other unit in this price range can master: one-touch copying.

At first glance, the CDM-4000 seems a throwback to the early days of CD–R when to create a CD you first had to create a complete physical image file on an expensive non-DOS-formatted image disk. With the advent of cyclical buffering schemes and incremental recording techniques, the need for a dedicated hard disk has been nearly eliminated. Why then would DynaTek offer a unit with a dedicated non-DOS hard disk?

The answer lies partly in the near collapse of hard disk prices, partly in Gear's poor support for on-the-fly recording, and partly in the CDM-4000's intriguing one-touch mode. In this mode, the CDM-4000 works as a standalone device.

The unit's one-touch recording is a bit of a misnomer. To copy a CD, you put the source disk into the Yamaha drive and push one button. The CDM-4000 copies the disk to the image drive. Then you press another button so the image can be written to a CD–R disk. Nevertheless, it is an extremely simple process, and once you've created the image file, you can continue to create CDs from the image with one touch.

We created numerous CDs with a minimal amount of effort using the standalone feature and were unable to cause a buffer underrun using DiscMaster, DynaTek's customized version of the Gear software. On occasion, the CD we created under the one-touch process was readable but contained some defective files (probably due to hard disk errors).

Unfortunately, DiscMaster's estimation process does not trigger the image drive, so it's report is useless. For example, when we tried to copy a CD-ROM using the software, Estimate reported a transfer rate of 153 sectors per second—too slow to support quad-speed recording. But the CDM-4000 easily burned the CD at 4X, and the entire 204MB was written to CD at an overall transfer rate of 236MB per second. Other quirks abound. For example, the software reports 1X (real-time) recording speed while the Yamaha CDR-100 is writing at 4X. The CDM-4000 provides no test facility to verify your image file and no way to troubleshoot a failed session.

LOOK MA, NO PC: *With its built-in hard disk, the CDM-4000 works as a standalone CD mastering device.*

The DiscMaster software only works under Microsoft Windows 3.1x. You can copy an audio CD via the one-touch method, but you cannot build a track list to create a customized audio CD. The self-contained unit is not recognized by Windows 95 and does not work with any third-party software. Despite these limitations, the CDM-4000's ease of use and one-touch feature make it worth considering.

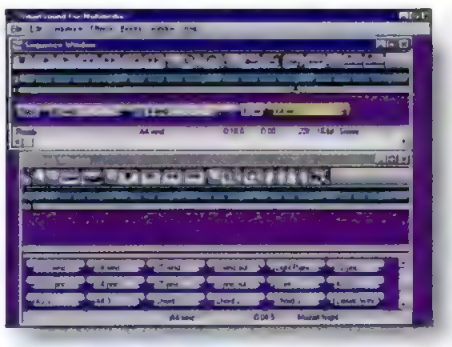
CDM-4000 Quad-Speed CD Mastering System. Street price: $3,600. Requires: 4MB RAM, 25MB hard disk space, Microsoft Windows 3.1 or later. DynaTek Automation Systems Inc., Bedford, Nova Scotia, Canada; 800-267-6007 (U.S.), 800-461-8885 (Canada), 902-832-3000; fax, 902-832-3010. *Circle 406 on reader service card.*

AUDIO

SmartSound Settles the Score for Presentations

By Craig Stinson

Need a high-quality soundtrack for your next presentation? The $179.95 SmartSound for Multimedia can help. SmartSound makes it easy for nonmusicians to generate professional sounding .WAV files for any OLE container software.



DRAG-AND-DROP COMPOSER: *SmartSound's editor breaks down music into blocks.*

SmartSound has two main components: a wizardlike Maestro and an editor. Along with the software, the program's CD-ROM includes 74 minutes of music in a variety of styles and sound-effects files.

The Maestro helps you assemble a soundtrack. Soundtracks can be designated as openers, finales, accents, or background, and times can be specified to tenth-of-a-second accuracy. Styles range from classical to jazz. Once you answer the Maestro's questions, you get a number of musical samples to preview. After you select a soundtrack, you can funnel it into the editor.

The editor breaks sound files into movable blocks, and you can then string them together like pop beads. For example, the woodwind selection, "Mozart Night," comes disassembled into more than 60 snippets. You can organize them into any sequence you please by dragging blocks with the mouse. Simple playback controls let you hear what you've assembled. If you put pieces together that don't fit musically, SmartSound throws up a flag. It also provides functions for smoothing the transition between blocks.

With the help of a Clipper command, you can import existing .WAV files and break them up into snippets. And an Effects menu lets you add various kinds of distortions, echoes, and filters.

When you've got your sequence the way you want it to sound, a menu command writes it into a an 11K, 22K, or 44.1K mono or stereo .WAV file.

Even without audio CD import and AIFF/AU export capabilities (both in future versions), SmartSound for Multimedia makes putting quality audio behind your visuals easier than ever.

SmartSound for Multimedia. List price: $179.95. Requires: 4MB RAM, 2MB hard disk space, Microsoft Windows 3.1 or later, or Windows 95, sound card, CD-ROM drive. Sonic Desktop Software, Chatsworth, CA; 800-454-1900, 818-718-9999; www.sonicdesktop.com. *Circle 405 on reader service card.*

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Second Looks

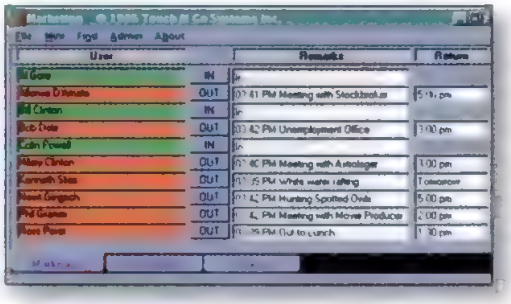
LIVING WITH THE PRODUCTS WE REVIEW

By Brian Nadel

GROUPWARE

Keeping Tabs on a Big Office

IN OUR INITIAL REVIEW of Touch N' Go (First Looks, December 5, 1995), we were impressed with this electronic in-and-out board's ability to track the whereabouts of up to 20 coworkers, but we were disappointed that the program couldn't scale to larger offices. Engineers at the software company, based in Anchorage, Alaska, heard our plea, went back to the drawing board, and built the Touch N' Go Enterprise Server 100, which can keep tabs on large workgroups and even an entire firm.



Server 100 runs on Microsoft Windows 3.11, Windows 95 or Windows NT and can be configured to track the location of up to 100 people; larger installations can link an unlimited number of 100-person groups, with each acting as a separate database. Server 100 retains the standalone version's ease of use and intuitive interface, while giving the administrator power to organize and track a group. When you're leaving the office, all you do is click on IN and fill out a dialog box with information as to where you're going and when you'll return. All clients are then updated as to your status.

Beneath its unassuming interface, Server 100 is packed with power. For instance, each 100-person group can be categorized into as many as five subgroups, organized alphabetically (such as A through E, F through J, and so on) or by function (Administration, Delivery, Sales, and so on), or in any way the administrator chooses. To get an idea how effective Server 100 can be, take a look at Touch N' Go's Web site (*http://www.touchngo.com*). There you can see what the program's interface looks like and download a fully functional version good for 30 days; after that, you can register the program for $249.95.

With the Touch N' Go Enterprise Server 100, you'll always know who's working hard and who's hardly working.

BUG BRIEFS

PROBLEM

Micrografx's QuickSilver (First Looks , May 28, 1996) is a great way to inject some interactivity into Web graphics, but it only worked as a Netscape Navigator plug-in, not with Microsoft's Internet Explorer.

SOLUTION

With the delivery of an Active X version of QuickSilver, the program now works just as well in Internet Explorer as in Navigator. A demo version is available from Micrografx's Web site (http://www .micrografx.com) or you can order a CD-ROM version for $9.95 (800-640-2049).

PROBLEM

Stardock Systems' Object Desktop (First Looks, February 6, 1996) puts a brighter, more functional face on OS/2 Warp, but it can't easily backup and restore Workplace Shell objects.

SOLUTION

With Version 1.5, you can back up individual Workplace Shell objects and entire desktop schemes, and even share them with friends or coworkers. The upgrade costs $45 for registered users or $89.95 for new users. (800-672-2338).

UTILITIES

PartitionMagic's Declaration of Independence

POWERQUEST'S PARTITION-Magic is our choice for repartitioning a large hard disk. Unfortunately, the version we reviewed in First Looks (March 26, 1996) worked best when it was installed on and run from a PC's hard disk. Version 2.03 changes all that, with an easy way to run the program from a floppy disk.

The patch, which is about 500K, is available free from a variety of online outlets. Be careful to get the correct files, because there are several different packages, depending on the version of PartitionMagic you're running and the operating system you use. Major download outlets are the company's File Transfer Protocol site (*ftp.powerquest.com*); its Web site (*http://www.powerquest.com/download.html*); and its bulletin board at 801-226-5608.

This update to an already good utility makes it easy for a system technician to partition a hard disk without leaving any trace behind.

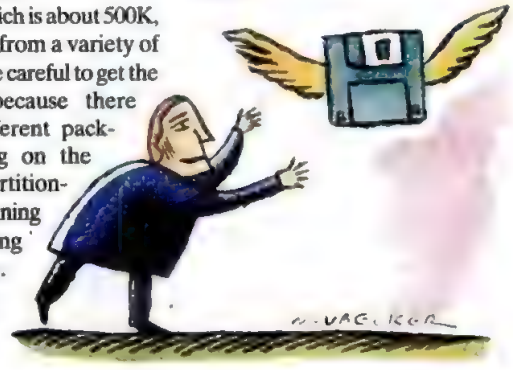
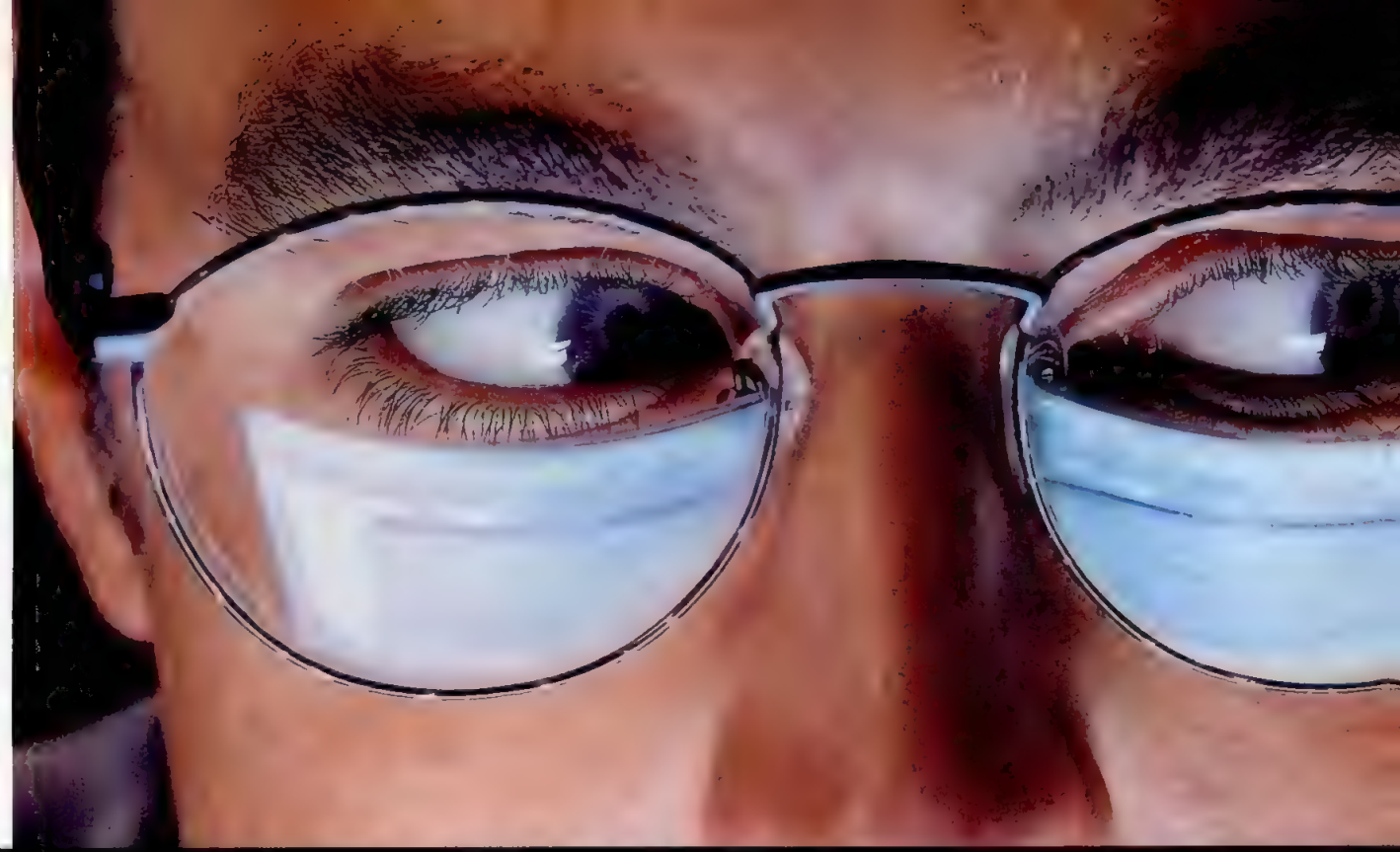


ILLUSTRATION BY ROBERT NEUBECKER

LOOKING AHEAD

Tell us what you love and hate about these products and we'll share the information in future issues. • 3-D software and hardware • CD-ROM encyclopedias • Color ink jet printers • Cyrix CPUs • EZ SCSI 4.0 • Lotus Notes Release 4 • Microsoft Internet Explorer • Netscape Navigator • 200-MHz Pentium PCs • RealAudio • SoftWindows • V.34 modems • Web search engines • Windows 95 utilities. Contact Brian Nadel directly via MCI Mail (556-1500) or CompuServe (72241,1616), or on the Internet at BNadel@zd.com.



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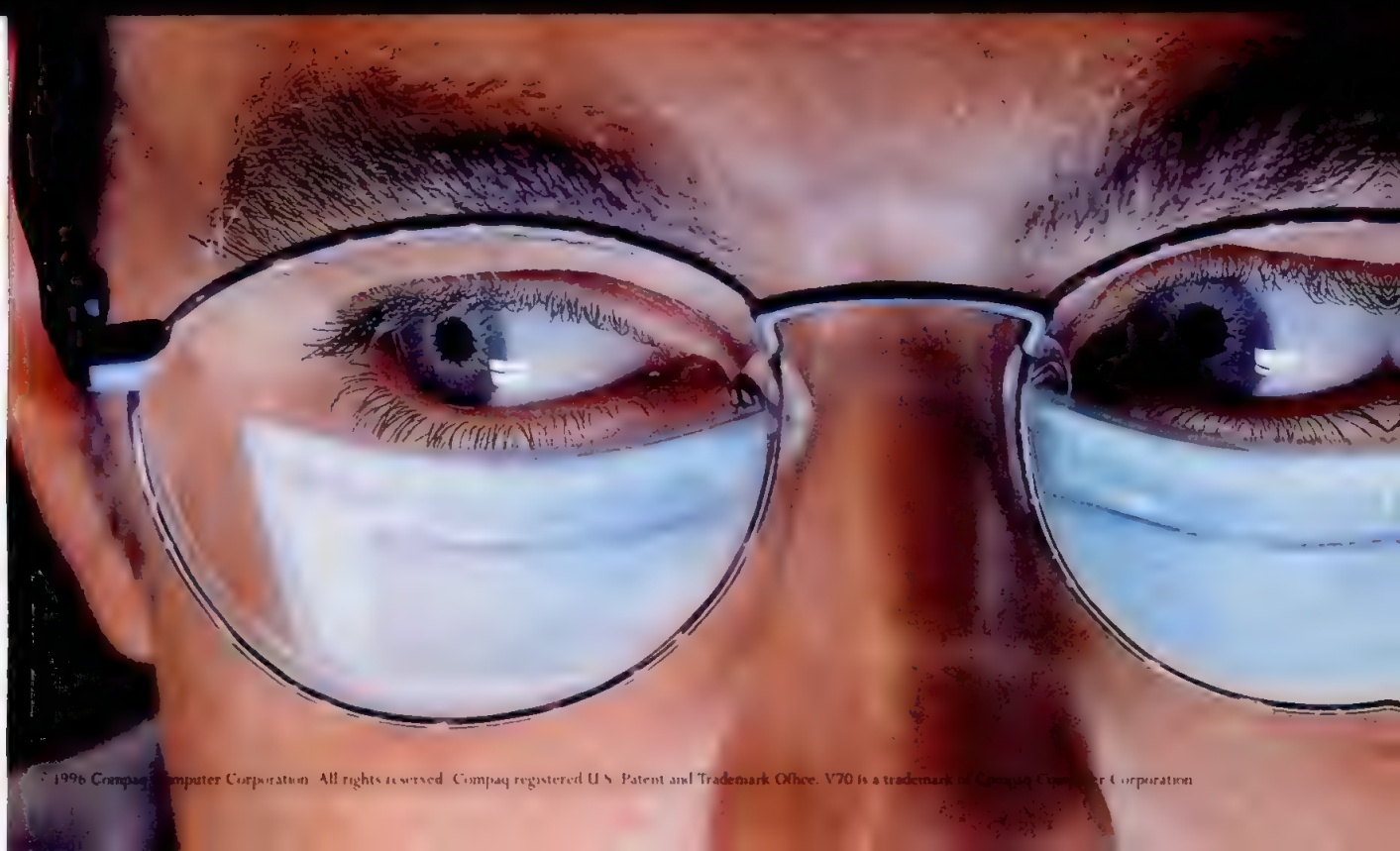

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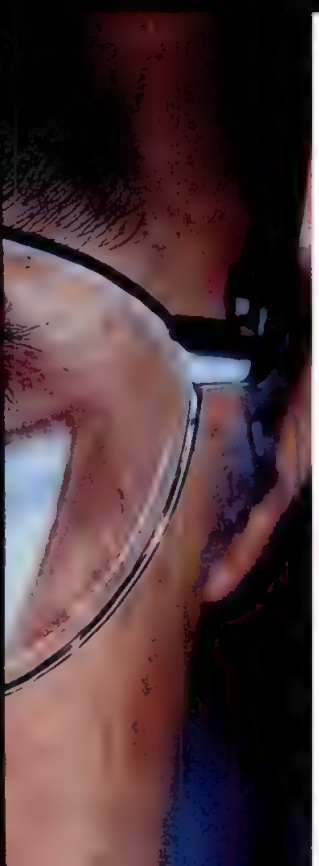
Look left. Look right. When was the last time you had to do that to see everything on your screen? We thought so. Small screens are great for hand-held TVs. But for computers running today's applications, the bigger the screen, the more information you see and, chances are, the more productive you are.

Introducing the Compaq V70 monitor.

Introducing the Compaq V70 17" (15.67" viewable) computer monitor.

OU LOOK AT COMPUTER MONITORS.



It has features that will put it high on the wish list of everyone in the company. The larger screen means applications won't have to be scrolled back and forth so much or reduced to eye-straining proportions. It also has an extremely fine dot pitch and high resolutions for crisp, sharp images and on-screen controls that allow for very easy and precise adjustments. What's more, the highest refresh rate in its price range keeps the screen flicker-free. In fact, for the money, you won't find another monitor with such an impressive list of features. Go ahead, look around. For more information, call 1-800-818-9088 or visit us at www.compaq.com.

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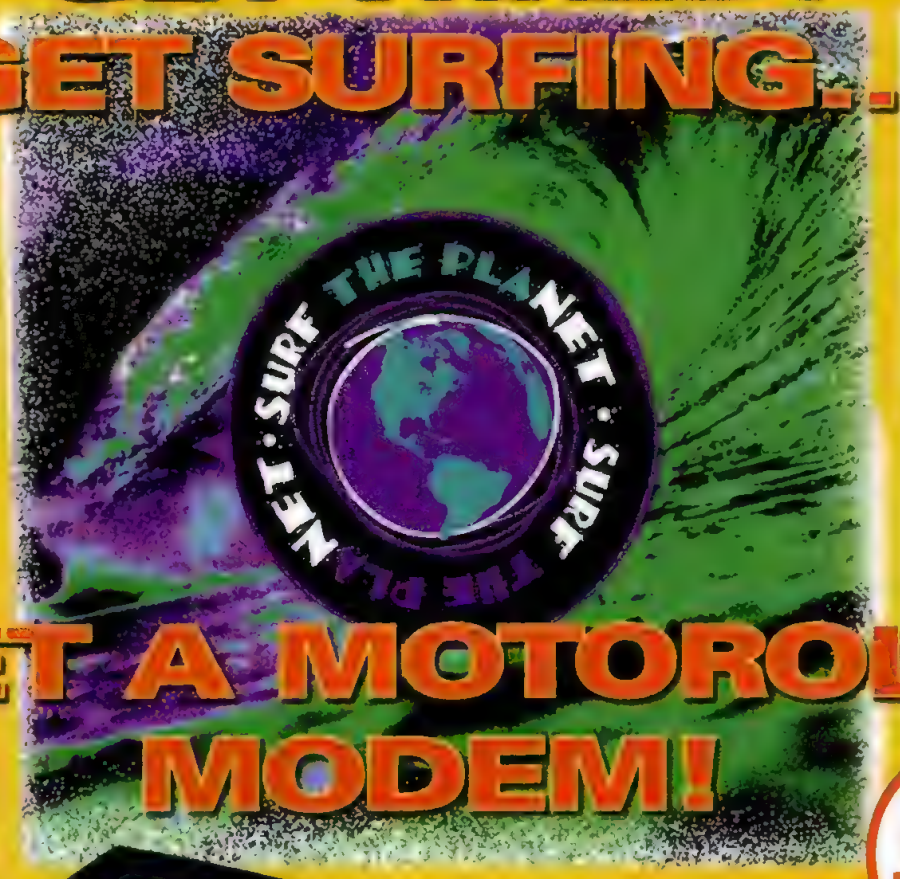

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New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Melissa J. Perenson

Your Web Surfing Companion

COUNTLESS ADD-INS HAVE BEEN DEVELOPED FOR NETSCAPE Navigator and Microsoft Internet Explorer. DataViz's $49 **Web Buddy** stands out from the crowd in that it's the first single utility to deliver a suite of Web browser enhancements under one roof.

Available for Microsoft Windows 3.1 and Windows 95, Web Buddy's floating, browser-independent toolbar offers one-click access to six key functions. It's never been simpler to save single Web pages and entire Web sites—complete with graphics and links—to your hard disk for archiving information of interest. Unlike other off-line browsing packages, Web Buddy does not automatically overwrite pages with the same URL and title, and it even prompts you to enter a page title of your choosing (which makes it easier to later store your downloaded pages). Pages are organized in customizable categories in Web Buddy's file cabinet. As with other off-line browsers, you can schedule intervals for Web Buddy to grab pages and sites automatically.

A handy feature lets you easily grab and convert any Web page or graphic and import it into your word processor or graphics package. **DataViz Inc.,** Trumbull, CT; 800-733-0030, 203-268-0030; www dataviz.com/webbuddy. *Circle 414 on reader service card.*

A Photo Printer Of Your Own

UNTIL NOW, THERE'S BEEN a key limitation to the personal photo scanners and image editors designed for the masses: Once you've manipulated your image, what do you do next? To share your masterpiece would mean that friends and family have to cluster around the PC; or you could print your image on an inkjet printer. But even with photo-enhancing paper, it's just not the same as having a real photograph.

That is about to change with offerings from Fuji Photo Film USA and Mitsubishi Electronics America. Although neither is priced for mass consumption yet, both are poised to advance the personal digital printing market.

Priced at $600, the **FujiFilm Print-it Personal Photographic Print Maker** draws on FujiFilm's Thermo-Autochrome, noncartridge color printing technology to achieve outstanding, photo-realistic images. The printer is designed to be used in conjunction with your PC or your television. The sleek device produces 24-bit, 150-dot-per-inch (150-dpi), 3.3- by 5.0-inch color images in under 2 minutes, at a cost per page of just 75 cents. Images are formed through a dry print process that creates color in response to heat and requires no ink cartridges.

The $495 **Misubishi CP-D1 Digital Color Printer** uses a dye sublimation process to achieve sharp, photorealistic prints. The printer, which also creates prints of 3.0 by 5.0 inches in about 2 minutes, produces 8-bit, 149-dpi images at a cost per page of about 80 cents. A kit with replacement ink cartridges and paper costs $40.

Fuji Photo Film USA Inc., Elmsford, NY; 800-378-3854, 914-789-8100; www.fujifilm.co.jp. *Circle 412 on reader service card.*

Mitsubishi Electronics America, Cypress, CA; 800-843-2515, 714-220-2500; fax, 714-236-6339. *Circle 413 on reader service card.*

Graphics Conversions

FOR ALL ITS MERITS, MICROsoft Office supports a limited number of graphics formats. If you're tired of having to convert or cut and paste graphics files into Office manually, then you'll make good use of INSO Corp.'s $69 **ImageStream for Microsoft Office.**

By providing 20 popular graphics format filters missing from Office, the ImageStream add-on lets you import graphics from such application file formats as AutoCAD Native Drawing Format, Adobe Illustrator, Harvard Graphics, and Micrografx Designer. Enhancements to 15 of Office's existing filters improve formatting retention. **INSO Corp.,** Boston, MA; 317-753-6500; fax, 617-753-6666; www .inso.com. *Circle 415 on reader service card.*

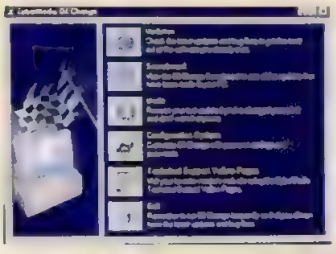
PHOTOGRAPHS BY THOM O'CONNOR

HOT PROSPECT

Toss Away Your Upgrade Disks

With CyberMedia's $50 **Oil Change,** you may never have to upgrade again. Oil Change helps you forget about self-extracting .EXE files, arcane install routines, and online upgrades that lack any semblance of instructions. Consider it your own personal upgrade assistant—and system maintainer.

Predicated on the assumption that software companies are posting bug fixes and updates on their World Wide Web sites, Oil Change will drastically minimize the need to update your software manually in the future. Oil Change builds a record of what software versions you have installed and then checks this list against CyberMedia's continually updated, online registry of available updates and their online locations. The software will then notify you via e-mail when an update is available, and if you so indicate, it will go out onto the Internet and automatically download and install the necessary update files on your system.



You can set Oil Change to check for new updates at regular intervals, or you can check yourself on demand. As a precautionary measure, the software automatically creates backup copies of your original, installed files, making it simple to undo any update that goes awry.

CyberMedia Inc., Santa Monica, CA; 310-581-4700; www.cybermedia.com. *Circle 427 on reader service card*

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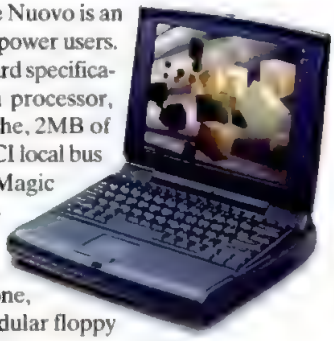
WITH A NAME THAT'S SUPPOSED TO EMBODY ITALY'S REPUTATION for innovative designs, Acer's **AcerNote Nuovo,** sets the stage for Acer's latest line of notebooks.



With prices starting at $3,500, the Nuovo is an affordable system that's primed for power users. The seven-pound notebook's standard specifications include a 133-MHz Pentium processor, 16MB of EDO RAM, 256K L2 cache, 2MB of EDO VRAM, a 1.2GB hard disk, PCI local bus video with a 128-bit MPEG NeoMagic graphics accelerator, integrated microphone and 16-bit sound, an integrated 28.8-Kbps DSVD fax/data modem and full-duplex speakerphone, one Type II PC Card slot, and a modular floppy disk drive that can be swapped out with the six-speed CD-ROM drive. You have the choice of an 11.8-inch active-matrix display or an 11.3-inch passive display.

Sleekly designed, the Nuovo also boasts a long battery-life expectancy; according to Acer's projections, the Nuovo's single lithium ion battery should last between 5 and 10 hours.

Acer America Corp., San Jose, CA; 800-733-2237; fax, 408-922-2933; www.acer.com/aac/. *Circle 419 on reader service card.*

Net Presenter

AS MORE AND MORE CORporate documents move to the Web, you're going to be faced with the prospect of posting presentations online.

Net-Scene's $499 **PointPlus** makes it easy to use Microsoft PowerPoint to design and publish graphically dynamic multimedia presentations on the Web. This package, which works with Netscape Navigator, utilizes a proprietary compression technology to convert existing presentations for simultaneous viewing online.

Net-Scene, San Antonio, TX; 800-375-5531, 203-271-4670; www.net-scene.com. *Circle 420 on reader service card.*

Sales Suite

MARKETING PROFESSIONALS will relish Group 1 Software's $1,995 **Smart Marketing Suite,** which seamlessly integrates a host of marketing and business functions.

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Group 1 Software Inc., Lanham, MD; 800-368-5806; fax, 301-918-0735; www.g1.com. *Circle 418 on reader service card.*

Calling All Multimedia Authors

MACROMEDIA HAS TAKEN MULTIMEDIA AUTHORING TO the next level with the $4,995 **Authorware 3.5,** a complete authoring solution for creating interactive multimedia applications.

You can now take an application created in Authorware's object-oriented, drag-and-drop environment and use Macromedia's Shockwave technology to generate a compressed runtime version of the application for delivery over an intranet. URLs and other hypertext links can be embedded within your Authorware document. Also new to this version are cross-platform conversions and integration with Macromedia's Director Multimedia Studio, which is included with Authorware.

Strata's $795 **MediaForge 2.0 for Windows 95/NT** is a multimedia authoring package that lets you create and order events by using dialog boxes whose instructions come in plain English. Strata has also added its ~mirage Web Technology Initiative (which includes a Netscape Navigator plug-in, multimedia file support, HTML, and Visual Basic), so you can create Web applications using MediaForge.

Macromedia Inc., San Francisco, CA; 800-326-2128, 415-252-2000; www.macromedia.com. *Circle 416 on reader service card.*

Strata Inc., St. George, UT; 800-678-7282, 801-628-5218; fax, 801-628-9756; www.strata3d.com. *Circle 417 on reader service card.*

BRIEFS

Books

There's more to creating high-quality images than scanning them into your computer. ***Start with a Scan,*** by Janet Ashford and John Odam, is a colorful guide to converting ordinary scans into high-quality, eye-catching objets d'art ($34.95, Peachpit Press, 800-283-9444) .... Who needs a broker when you've got a PC. ***The Worth Guide to Electronic Investing,*** by Jim Jubak, shows you how to play the market from the comfort of your computer. ($17.50, Harper Business, 800-331-3761) .... The first in the "Learn Now" series, from Microsoft Press, ***Learn Visual Basic Now,*** by Michael Halvorson, will have you writing Windows programs in no time. Included is a "light" version of Visual Basic 4.0 on CD-ROM ($39.95, Microsoft Press, 800-677-7377).

Internet

Trying to map out your path through the labyrinthine Web? DocuMagix's $29 **HotMap 1.0** uses NetCarta's spider and mapping technology to create easily navigated maps of Internet and intranet sites (800-362-8624) .... DataTimes Corp.'s EyeQ business information network is offering **Business Analyst,** a component of its service that delivers targeted financial information on companies, the market, and assorted investment-related data culled from such industry sources as Disclosure, Standard & Poors, TRW Business Credit Summaries. Monthly fees start at $39 (800-642-252 .... Do you want to protect licensed or proprietary images displayed on your Web site? Maximized Software's $499 **SiteShield** is a Web server software module designed to prevent the saving of images (*maximized.com*).

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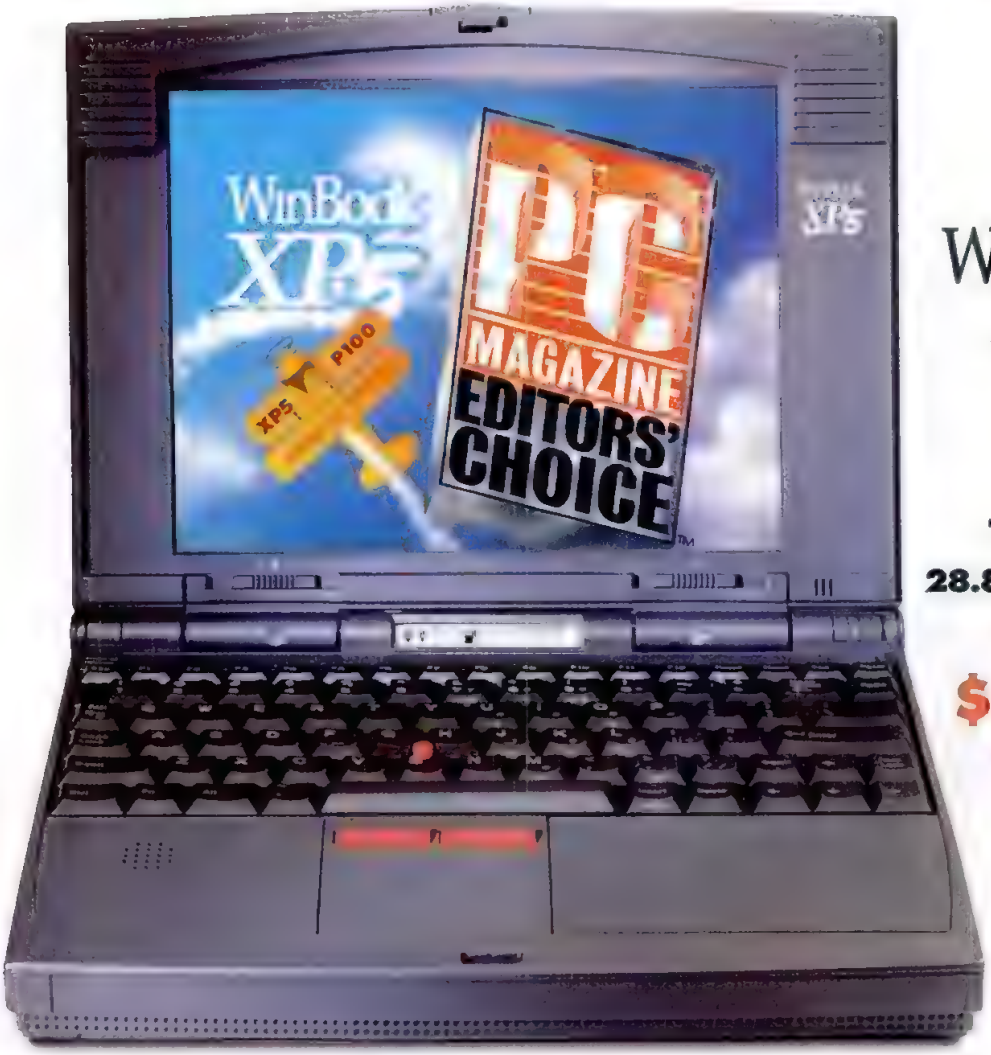

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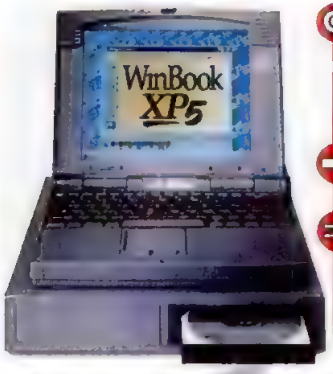

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Helpful hint:

Rip out and pin up next to Compaq and IBM ads.

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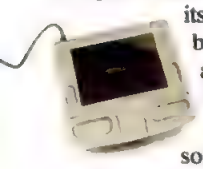
Touchpad Redux

WELCOME TO THE NEXT LEVEL IN TOUCHPAD TECHNOLOGY. Cirque Corp.'s $89 **GlidePoint Touchpad 2** features both physical and technical enhancements to the input device. The most noticeable changes are the pad's increased surface area and the inclusion of a triangular zone in its upper-right-hand corner, which adds the ability to double-tap on the pad to access right-click functions. There's also a motion sensor, so that the cursor continues in the same direction even after you've hit the edge of the pad.



Meanwhile, Touché Technologies has upgraded its software for the $59.95 **Touché TouchPad.** The software adds speed scrolling, the ability to set parameters for program boundaries that keep your cursor from flying off the active window, and support for gaming, which allows you to increase the speed of your movements when used with some of the most popular games.

Cirque Corp., Salt Lake City, UT; 800-454-3375; fax, 801-467-0208; www.glidepoint.com. *Circle 421 on reader service card.*

Touché Technologies Inc., Sausalito, CA; 800-223-6433, 415-331-6622; www.touche.intltech.com. *Circle 422 on reader service card.*

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Deloitte & Touche Consulting Group, Fairport, NY; 800-887-9790; www.peerscape.com/converge. *Circle 423 on reader service card.*

Riding the P200 Wave

THERE IS A NEW FLURRY OF PCs THAT ARE BEING offered by Micron Electronics, IBM Personal Computer Co., and Dell Computer Corp., and all of them feature the Pentium 200 processor.

Micron's **Home MPC P200** systems for the home market are particularly aggressively priced. For $2,700, you can purchase a system that has 16MB of EDO RAM, a 2GB hard disk, an 8X CD-ROM drive, 256K cache, a Sound Blaster 16 sound card, a Diamond Stealth S3 Virge 3-D 2000 graphics card with 2MB of VRAM, and a 17-inch monitor. Upgrading the system to 32MB of RAM increases the price to just $2,939.

IBM's high-end **Aptiva C73 P200** home PCs start at $2,899 for a system with 16MB of EDO RAM, a 2.5GB hard disk, an 8X CD-ROM drive, 256K cache, an ATI Rage 3-D graphics chip set, a Universal Serial Bus port, and an IBM MWave Modem, and Audio DSP solution. Among the options available are a $199 internal Iomega Zip drive and dual processors.

If you require a more business-oriented system, look no further than Dell's attractively priced **Dimension XPS P200s.** Starting at $2,499, the systems include 32MB of SDRAM, a 1.6GB hard disk, an 8X CD-ROM, 512K cache, Vibra 16-bit audio chip set, a Number 9 Virge 3D Video Card with 2MB of EDO RAM, and a 15-inch Trinitron monitor; software includes Microsoft Office Professional.

Micron Electronics Inc., Nampa, ID; 800-388-6334, 208-463-3434; www.mei.micron.com. *Circle 424 on reader service card.*

IBM Personal Computer Co., Somers, NY; 800-426-7235, ext. 4340; www.pc.ibm.com/aptiva. *Circle 425 on reader service card.*

Dell Computer Corp., Austin, TX; 800-289-3355, 512-338-4400; www.dell.com. *Circle 426 on reader service card.*

BRIEFS

Software

Want to take a weekend getaway? Consult CD-ROM Travel Planners' comprehensive $49.95 **Bed & Breakfast Guide North America** (800-472-3478) .... Create your own Windows 95 shortcuts with Affinity Microsystems' $49.95 macro recorder, **Tempo Shortcutter 1.5** (800-367-6771) .... MacSourcery's **CinéMac for Director Screen Saver Factories** lets you create your own screen saver by including still images, animation, and video and audio clips of your choice as compiled in Macromedia Director. Prices start at $299 for a license to distribute up to 10,000 screen savers (800-622-7723).

Hardware

XI Computer Corp.'s $4,488 **Xi P400 MTower DP** is a dual Pentium 200 processor–based system aimed at the high-end CAD and graphics market. It comes standard with 32MB of RAM, a 2.25GB Wide SCSI hard drive, a six-speed CD-ROM drive, Creative Labs AWE32 sound card, a Matrox Millennium graphics card with 2MB of WRAM, and a 28.8-Kbps U.S. Robotics modem (800-432-0486) .... KDS U.S.A.'s **Visual Sensations VSx-7** is a $649 17-inch monitor that features 28 to 66 KHz, a.28-mm dot pitch, 1,280 by 1,024 resolution at 60 Hz, and two speakers built into the base of the monitor (800-237-9988) .... Argus Industries' $649 **Photo Byte** digital color printer uses a thermal dye-sublimation process to print photo-realistic graphics at true color (847-297-8900) .... Data Technology Corp.'s $225 **DTC HardCopy** is an EIDE card for your PC that uses RAID-1 to write identical data to multiple drives automatically and simultaneously. Should your primary hard disk fail, the card switches over to the mirrored drive to provide uninterrupted computing (408-942-4000).

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ViewSonic 15GA	15"/14.0"	0.27mm	1,280 x 1,024	Yes	Yes	$499
ViewSonic 17GS	17"/16.0"	0.27mm	1,280 x 1,024	Yes	Yes	$699
ViewSonic 17GA	17"/16.0"	0.27mm	1,280 x 1,024	Yes	Yes	$799
ViewSonic GT770	17"/15.9"	0.25mm*	1,280 x 1,024	Yes		$899
ViewSonic 20G	20"/18.4"	0.28mm	1,600 x 1,280		Yes	$1,299
ViewSonic GT800	20"/19.1"	0.30mm*	1,600 x 1,200	Yes		$1,899
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Getting the (Digital) Picture

Digital photography is here—sort of. In theory, you can snap a digital picture, manipulate it in your machine's memory, print it on a high-quality printer, and get near-photographic results. The computer part is easy; picking the right digital camera and the right printer is the challenge.

Digital cameras are plentiful. I've had great success with the Epson PhotoPC, whose 640-by-480, 16-million-color image is good enough for Web pages, newsletters, and digital snapshots. It's a bare-bones, point-and-shoot camera, but it has by far the best resolution for the money. I wrote recently about taking the PhotoPC to Greece and the success we had in building an electronic slide show ("Breaking the Law," *PC Magazine,* June 11, 1996). Printing full-color hard copies wasn't a particular challenge, but it was a learning experience about what works, what doesn't, and what constitutes acceptable output.

My first test was with the Tektronix 340 thermal wax printer, which I use extensively to proof color layouts and judge new page designs. It's a fast PostScript printer, a workhorse of a graphic arts printer that produces what are unquestionably the best-looking overhead transparencies I've ever seen from a color printer. For all its fine qualities, however, the Tektronix 340 comes up a bit short when it comes to photographic images. The 300-dot-per-inch resolution leaves something to be desired, and the inks produce colors that are somewhat hard-edged and garish. Its $5,000 price tag puts it beyond the hobbyist realm, too.

I then looked at the crowded, highly competitive ink jet printer market. Hewlett-Packard, Canon, and Epson pretty much head the pack. I settled on the Epson Stylus Pro, because its 720-dpi resolution and control of color density through variable droplet size give it an edge over the competition, at an agreeable sub-$500 price. Ink jets, however, are slow. The Stylus Pro can take 10 to 15 minutes to print a photograph at the highest resolution. The results you get vary directly with the quality of the paper. High-quality ink jet paper is a must, even for the quicker 360-dpi prints. Clay-coated 720-dpi paper produces images that are dramatically more saturated and noticeably higher in resolution. Ink jet printers have one more trick up their sleeves: glossy paper. Actually a thin layer of transparent plastic on a paper backing, glossy paper allows very little diffusion of the ink dots and gives a brilliant, crisp image. On first glance, you could mistake a 720-dpi glossy print for a dye-sublimation print.

My final stop on the printer trail was the Tektronix 550 color laser printer, with up to 1,200-dpi resolution. I'm going to revisit this printer and my experiences with it in a future column. Ink jet printers have a surprising advantage over color lasers: The blending of ink droplets inherent to ink jet technology yields a painterly quality that makes the lasers' output look cold and clinical by comparison. But both kinds of printers revealed the limitations of the PhotoPC's 640-by-480 resolution. I started experimenting with alternatives on the picture-taking side.

SAY CHEESE!

Digital photography relies on a delicate balance of technology, technique, and taste.

Play Inc.'s $199 Snappy turns out to be an excellent device for digital photography. You shoot pictures with your camcorder, and the Snappy converts them to digital still images that you can process and print. The camcorder also gives you preview, a wide selection of continuous-action shots, and a zoom lens. If you're shooting an immobile object, the Snappy can produce a 1,500- by 1,125-pixel image of it. The resolution is lower from single video frames or snaps from tape but still better than the PhotoPC's. One caution: Use lots of light. Most of us shooting video depend on the camcorder's low-light capabilities. Poorly lit video makes for very muddy digital images that no amount of image manipulation can improve.

The final way to get digital images is with a scanner. Of course, that reintroduces the process-and-wait hassles of non-Polaroid photography. I used a Logitech PageScan Color scanner to scan in 3-by-5 and 5-by-7 photos, with excellent results. The PageScan is a 300-dpi scanner, but it interpolates the scan for an effective 600 dpi.

Photography remains an art form, a delicate balance of technology, technique, and taste. Digital photography is no different—and may be even more demanding as you incorporate different image-capture media, color models, and printer characteristics. This is an exciting, fascinating medium, and the best part is that the darkroom is already there, sitting on your desk. □

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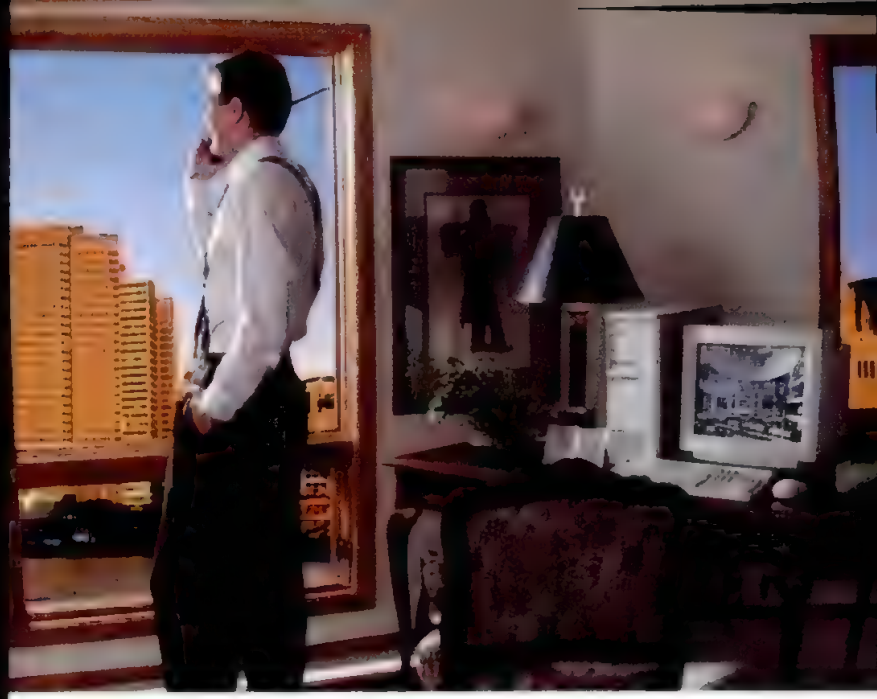

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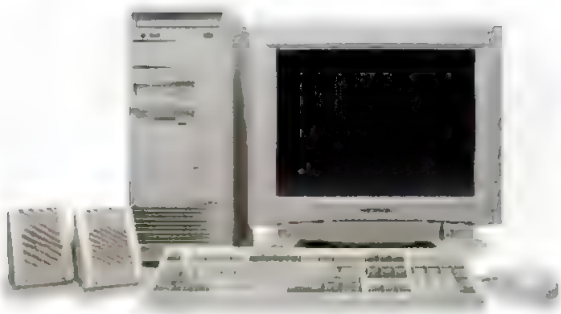

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JOHN C. DVORAK

How to Beat Microsoft

When you think about the ongoing battle between Microsoft and Netscape, you have to conclude that Microsoft will win, because, well, Microsoft is *huge*. But history has shown that a company with a lead in a given software category can beat Microsoft consistently. Netscape could do so, too.

In the past, Microsoft has taken over certain software markets only after the competition has faltered, sold out, or just lost heart. For years, WordPerfect dominated word processing. But by failing to move to Windows fast enough and then selling out to the bumbling Novell, it lost its leadership. Until recently, Lotus 1-2-3 dominated spreadsheets, but the program failed to keep up with the competition.

Lotus still dominates groupware. Adobe PageMaker, QuarkXPress, and others have staved off Microsoft in desktop publishing. And Microsoft hasn't even touched the CAD/CAM arena, which is owned by Autodesk.

Microsoft's original forte was programming languages, and it is the only category that the company has dominated from the outset. Even in the area of operating systems, Microsoft had to fight its way to the top. One thing about Microsoft, though: Once it wrests control from a competitor, Microsoft knows how to keep it. I doubt we'll see a better word processor or spreadsheet anytime soon.

It takes a lot of work to get control of a category that another company already dominates. But it's fairly easy to keep control of what you already have—assuming you play the game right. Like WordPerfect, Netscape can be the thorn in Microsoft's side if the company follows my eight tips:

1. Make customer support number one. This is how WordPerfect attracted legions of devoted followers. Netscape is in over its head with support and should use some of its cash to create a WordPerfect-style support organization. The company could even find the people responsible for the WordPerfect support team and hire them.

2. Get out of Unix hackdom. Netscape can't remain a company where every coder on its team of techies would prefer to be doing Unix. This is a college-kid mentality.

3. Court PC user groups. When I addressed a user group a few weeks after Netscape VP Marc Andreesson, the members told me they had been disappointed because Andreesson had delivered a canned marketing rap. I'm sure someone in PR had put him up to it. These canned presentations stink. Bill Gates's speaking engagements have degenerated into marketing pitches, as well. Nobody cares about this. People want connection, not propaganda.

4. Play for keeps. Netscape President and CEO Jim Barksdale's recent comment, that it would be fine if Microsoft were a $40 billion company and Netscape a $2 billion one, just won't fly. The only companies that have done well against Microsoft are the ones that go for the jugular.

STIFF COMPETITION

History shows that Microsoft can be beaten. Netscape can be the thorn in Microsoft's side.

5. Develop an OS strategy. The idea of a Windows 95 clone is not silly, and there are scores of coders who could produce a compatible OS. All that is needed is compatibility and performance. Borland used to drive Microsoft nuts with its charts showing better performance with its languages. This technique could still work.

6. Form partnerships with Microsoft's enemies. There are plenty of big companies that dislike Microsoft and its marketing tactics. Many are locked out of Microsoft's master plan and need a power base. Netscape needs to court these people in a friendly manner.

7. Don't stop running. Beta, beta, beta. Throw code out there faster than Microsoft. The company has more coders, but Microsoft's strength is in tweaking existing code, not inventing new programs. It drives Microsoft crazy when things are hectic and the company has to play catch-up.

8. Regard every Microsoft maneuver as a direct threat. This is the least-understood aspect of Microsoft. This company is very competitive, and while it hasn't been caught red-handed in the dirty tricks department ("the program isn't done until Lotus won't run"), one has to assume the worst when competing with it. I'm always stunned by companies that are so surprised when Microsoft manages to outflank them—as if that's so unexpected.

Of course, these tasks are far from simple. But the fact is that Microsoft can be beaten—especially in new categories in which the company missed the boat and has lost a little confidence in its vision. □

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CIRCLE 266 ON READER SERVICE CARD

JOHN C. DVORAK

Inside Track

Intel is starting to get mad. As you know, a while back Cyrix began promoting the idea of a **"P-Rating,"** which was designed to make Intel chips look second-rate compared with their Cyrix counterparts. Intel is so upset by this P-Rating concept and the fact that Cyrix is pushing machines with the letter *P* on them, the company is **putting the screws to manufacturers** who use the designation in their model names.

Intel has been threatening to stop paying its share of advertising costs to "Intel Inside" licensees if they use any other logos on their boxes. The company is sick of subsidizing the Microsoft Windows logo.

But it's not just Cyrix that's feeling Intel's wrath—the company is getting tough on other manufacturers, as well. Intel has been telling all of its "Intel Inside" program licensees that it will **stop paying its share of the advertising costs** (up to 66 percent)—which the company pays for most major vendors who use the "Intel Inside" logo in their advertisements—unless the advertisers get rid of any other logo on the box, such as Windows-compatible, Win 95, and even *PC Magazine* Editors' Choice logos. Many of these logos help sell the PCs, which is why they are used. So you have to wonder what Intel's vendetta is all about. The story I keep hearing is that **Intel and Microsoft are battling** over a number of issues, not the least of which is the huggy-kissy relationship Microsoft has with DEC and its Alpha chip. **Intel is sick of subsidizing** the Microsoft Windows logo.

A joker friend of mine suggested that all this was merely a precursor of the day when Intel will begin ordering computer makers to stop using even their own logos. "You can advertise, but only with our 'Intel Inside' logo." Uhhh, okay.

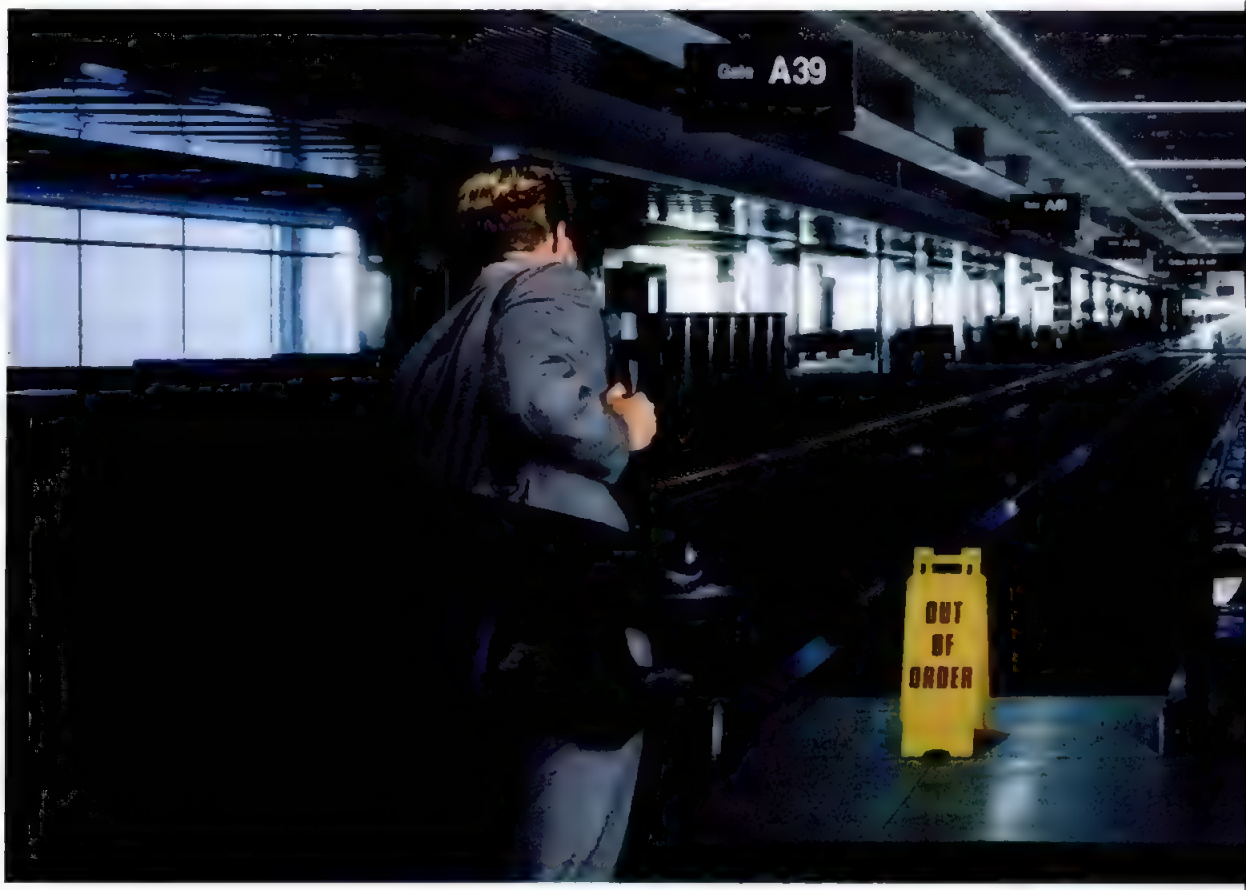
There's another interesting aspect to Intel's take-no-prisoners grab for more market saturation. I was told this story by some mucky-mucks high up at one of the top five PC makers. If you recall, last year Intel was gobbling up all the memory it could get its hands on with expectations of making a killing when Windows 95 came out. Rather than stocking basic configurations with loads of RAM, top PC vendors rely on optional memory sales to boost bottom-line profits. Intel planned to bundle its motherboards with a bunch of memory on-board and steal this opportunity from the computer makers. So it seems that executives in many of the top 20 computer companies decided among themselves to feed Intel bogus numbers and phony projections. Intel took the bait and bought too much memory, and it lost a bundle when prices crashed recently. Intel has since become skittish about the memory business, and the PC makers are happy once again.

Of course, now vendors **are force-feeding memory into the market** like never before, as prices plummet. Look for Dell to announce a plan whereby you purchase a Dell computer with 16MB of memory, and Dell will throw in another 16MB for $95. The 32MB computer is what everyone will be using by this time, 1997. And I predict memory will be **$5 per megabyte** within a year.

Mouse Shoulder Dept.: Anyone who has contracted a case of mouse shoulder, a form of tendinitis, usually has to find a mouse substitute if he or she ever wants to get rid of the ailment. It took me **nine months** to get rid of a severe case, and I was told that that amount of time is not unusual. Still, any excessive mouse use causes this condition to flare up again, so I got **an alternative keyboard** from IBM that incorporates the TrackPoint II pointing stick and allows you to use the feet-up-on-the-desk/keyboard-on-the-lap posture for typing. I've tracked down two models of this keyboard. The first is a full-size super-keyboard (part number 92G7461; $125). The newer one is a lightweight keyboard without a numeric pad (part number 84G2524; $155). I'm sure more models are buried on some parts list someplace, but this is a start for anyone who likes the TrackPoint and who might be developing mouse shoulder.

These **obscure IBM parts** bring to mind another part I tracked down recently that many will find useful. As you know, on many laptops there's a PS/2 port. Sometimes there's a mouse and keyboard port, but usually there's just one port. The design of the port, though, allows both a mouse and a keyboard to be plugged into the same hole—if you use a **PS/2 port splitter.** This way you can take that IBM ThinkPad 560 and plug it into a real monitor, add a keyboard and a mouse, and use it as a desktop PC without a port replicator or docking station. But just try to find a splitter! Well, I have, and it's from IBM (part number 54G0441). Called the **PS/2 Keyboard/Mouse Connector,** it sells for $39. Contact IBM PC Direct (800-426-2968) for all IBM options.

So, I'm thinking about these parts and other weird IBM devices, such as the IBM 7845 ISDN T-1 terminator/analog phone connector, that I've seen over the years. You have to wonder how many **billions of dollars** IBM could make if the company actually had a catalog. You know, like the J.C. Whitney catalog of weird auto parts. There must be **thousands and thousands of odd parts,** PC cards, and other devices that languish in IBM warehouses because the company doesn't have a comprehensive catalog. Why is IBM relying on people like me to tell folks about the keyboard/mouse splitter? All it would take is for IBM to hire a few catalog experts from JC Penney or Sears and make its managers actually list their products and describe what they do. It's a bonanza waiting to happen. □



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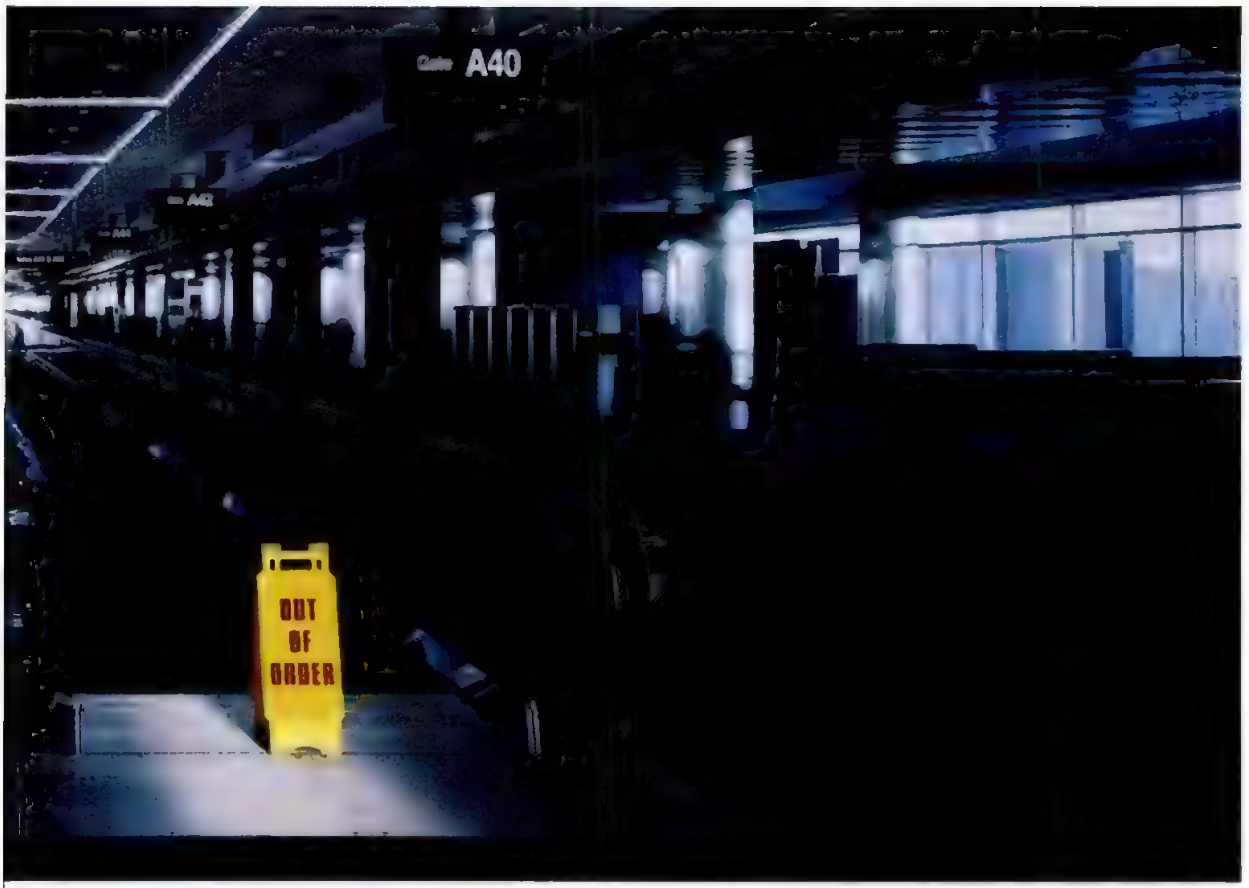

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CIRCLE 034 ON READER SERVICE CARD

JIM SEYMOUR

The Big Business Upgrade

It's hardly big news anymore that this year is going to see another big operating system upgrade as Corporate America starts moving to Windows NT Workstation this fall. When I first began telling audiences in January that we were going to go through this sea change, one of the biggest business opportunities of the decade in the PC industry, my listeners were skeptical. I couldn't blame them: this was contrary to everything else they were hearing, which was doom-and-gloom talk about a bad year for the PC business. But sometime in late spring that skepticism turned—almost overnight—to agreement. What had been heresy was now old news. "Oh yeah," audiences said. "We know about NT 4.0. Big deal, big move, the product IS has been waiting for. But, uhh, how is all that upgrading going to work?"

Good question, with big surprises for answers. Unlike other major upgrades over the past decade, this one isn't going to be about adding memory, swapping video cards, adding disks, then installing the software. Overwhelmingly, IS managers moving to Windows NT 4.0 aren't going to tweak and fiddle with existing boxes on users' desktops; instead, they will haul away those boxes, replacing them with entirely new, preconfigured Pentium machines preloaded with Windows NT 4.0 and the company's selected apps. Why?

First, Windows 95 taught us how nice it is to start with a clean machine when you go to a new OS. That's never been more true than with Windows NT 4.0. (For example, there's no tidy way of upgrading a Win 95 machine to NT 4.0: You're going to wind up installing all of your apps over again. Groan.) Second, many companies have edged only reluctantly into the Pentium Era, still relying mainly on (and sometimes, even buying) 486s. You don't want to run Windows NT 4.0 on a 486 if you can avoid it, so this is a good time for a double-clutch upgrade, hardware platform *and* OS. And third, though memory is cheap now, it's easier to rely on "new" memory—EDO, SDRAM—in a new box when you're moving up to 32MB, which is going to be recognized soon as the minimum for Windows NT users.

For corporations, the fix-or-replace decision begins with the surprisingly high cost of a "touch," a visit by a tech to a user's PC to open the box and add or replace something. In most companies, touches run from $125 to $150, plus parts. The cost by itself hardly justifies a replacement rather than a hardware upgrade, but it does get IS managers thinking. Add the cost of a CPU upgrade (or likelier, a motherboard swap), plus a larger (or second) hard disk, plus an up-to-date video board, plus 16 to 24 more megs of RAM, and the upgrade path begins to look mighty expensive. Fold into that the cost of Windows NT itself, plus the time to install it, clean up files, then reinstall the user's applications, and suddenly it becomes a no-brainer to simply swap that box for a new Pentium preloaded with Windows NT and the company's standard apps. (Not a bad way to clean out unlicensed software, too.)

A CHAIN REACTION

The Windows NT 4.0 adoption cycle is going to be a boom time for many PC vendors.

I've been in planning meeting after planning meeting this year when we worked out these numbers. Invariably, the numbers have almost always pointed to buying new PCs for Windows NT. Indeed, as far as I know, only one of my corporate clients is planning a large-scale "plug-in" hardware upgrade this fall, as opposed to delivering new machines preloaded with Windows NT to users' desktops. And that company has special circumstances making an upgrade the only acceptable route.

That's going to mean a huge boom for the PC hardware makers—Compaq, Dell, the usual suspects—that focus on the business-PC market. We've already seen the tip of the iceberg in orders from Smith Barney to Compaq and from Merrill Lynch to IBM for 25,000 PCs each, preloaded with Windows NT. These are going to be heady times for companies producing Windows NT–ready applications, too. (Remember that, despite what you've been told, not all Win 95–specific apps are Win NT–ready—Microsoft's demands notwithstanding. A number of superb Win 95 apps you and I rely on—LapLink for Windows 95, for example—don't work under Win NT. Buyer beware.)

So when market forecasters tell you this is going to be a so-so year at best for the PC industry, remember what Uncle Jim told you here: The next 18 months—the initial Windows NT 4.0 adoption cycle—are going to be a boom time for many PC hardware and software vendors.

So what does all this mean for you? Should you plan to

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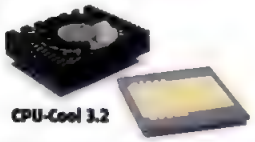

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JIM SEYMOUR

dump your semi-new Pentium/90, now just a year old, and move to Windows NT 4.0? Should you move to Win NT at all?

My advice: If you're using Win 95 and you're happy, stay put. Many of Windows NT 4.0's improvements don't have much to do with home- or small-business PC use. And you give up things like Plug-and-Play and advanced power management. Ditto if you're using a notebook PC, even if you frequently connect to a Windows NT Server LAN, or find yourself working in an office full of Windows NT 4.0 desktops. For another year, Win 95's going to be the better choice for mobile computing.

But what if you do choose to move to Windows NT 4.0 Workstation? Should you buy a new PC? Probably not. The economics and dynamics of upgrading versus swapping a 2,500-machine fleet of corporate PCs are very different than deciding what to do with that solo PC in your den or basement.

I've been working through a lot of hardware upgrades this spring and summer, and I've found several that make good sense for those jumping on Windows NT 4.0. Intel's newest Overdrive CPUs, for example, which crank up the original 60-/66-MHz Pentiums and the later 90-MHz units, are really worthwhile improvements. My ancient, 60-MHz P5 jumped about 60% to 70% in speed with an Overdrive. My 90-MHz machine "only" jumped up to about the speed of a 133-MHz machine—but those jumps are both well worth the money.

The new 2GB-and-up EIDE drives are also good investments. Running in tandem with your original half-gig-or-larger hard disk, they give you plenty of storage space for remarkably little money. (Caution: the 2.5GB drives may require a BIOS upgrade; check with the manufacturer's tech support.)

You don't need a new video card or monitor to go to Windows NT, but make sure you have the latest drivers for the card you do have. You'll almost certainly need more RAM. Don't try to cut corners with 16MB; you want at least 32MB. And if you can swing it—remember, RAM's very cheap now, and probably won't be by the end of the year—think about 64MB. Yes, 64MB. Windows NT is a slug with 16MB, okay with 32MB, and a delight with 64MB.

Sound like too big a bite for you? Then, please, stay with Win 95 for now. Let Windows NT sell itself to you over time, through other users' experiences. For a great number of *PC Magazine* readers, the move to Win NT 4.0 (and beyond) is inevitable—but not necessarily immediate. Think before you leap. □

BILL HOWARD

Sony's VAIO: Video Audio IO(U)

Can Sony succeed where others have failed in the home PC business? Sony, after all, is the world's preeminent consumer electronics brand. But then again, AT&T had a trusted name with consumers, and it managed to burn through several billion dollars in the PC business before throwing in the towel this year.

I believe Sony will succeed in the long run, despite stiff competition from PC vendors and from other consumer electronics/computer giants such as Toshiba. Just don't expect miracles from the first iteration of Sony's new PC line, called VAIO. Slated to debut in the fall, VAIO can best be described as a technology IOU for 1997 wrapped in a violet-colored case. The acronym stands for Video Audio Integrated Operation, and the stylized logo's sans serif "IO" is also the symbol for a digital bit pattern signifying *analog-to-digital*.

Sony wisely took the high road on performance specs. The systems, made by Intel, have Pentium CPUs starting at 166 MHz and hard disks starting at 2GB. The multimedia monitor has two tweeters plus a subwoofer in the base, but oddly enough, it comes only in a 15-inch model.

VAIO is an IOU for 1997, because the technology Sony plans to implement still isn't ready. There's no TV tuner, because Sony believes PC/TV tuners aren't quite good enough yet. (Obviously, when you're Sony, you're held to a higher standard for TV quality.) Universal Serial Bus connectors are on-board but not USB drivers or peripherals (nobody has them yet). IEEE 1394 (a.k.a. FireWire), the high-speed peripheral bus Sony needs for such high-speed audio/video tasks as capturing a video stream from a digital camcorder, isn't ready yet either.

WAITING GAME

It's not just Sony that's standing by. The entire industry is waiting for 1997.

It's not just Sony but the entire industry that's waiting for fall 1997. Fall 1995 was the season of Windows 95 and Pentium-based PCs. Fall 1996 will be an off-season in terms of new technology. But by fall 1997, we'll have

- MMX Pentium CPUs;
- DVD players in place of CD-ROM drives;
- MPEG II decoding for better-than-TV-quality, full-screen video;
- quality 3-D video and 3-D sound;
- a new, faster video bus called the Advanced Graphics Port (AGP);
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- personal videoconferencing that is affordable and of decent quality;
- PC-based controls for consumer electronics and appliances.

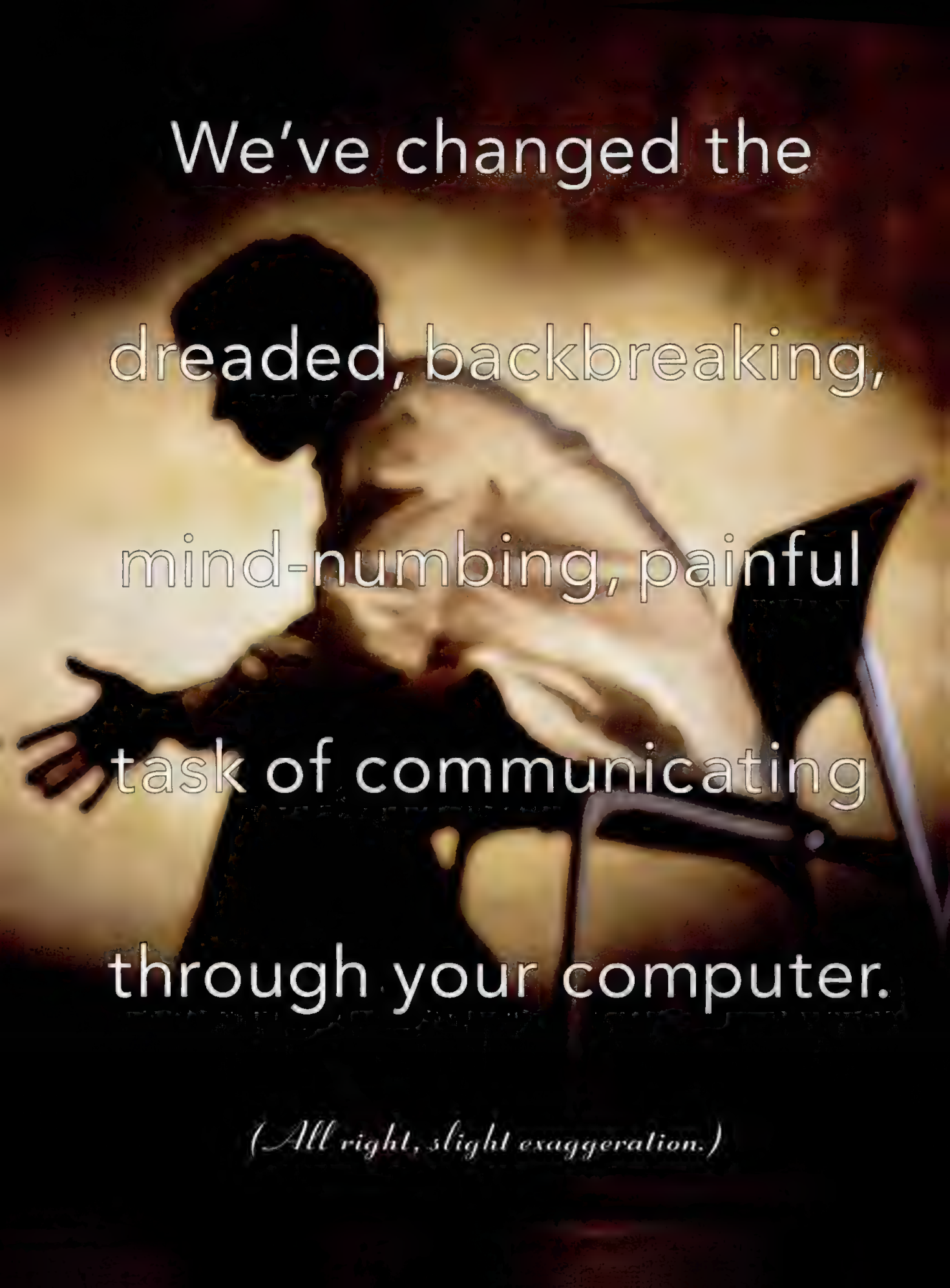
The Sony PC I'd like to see would control audio and video equipment. Imagine a PC that programs your VCR, catalogs and classifies your audio CD collection (maybe your data CDs, too), and can program an entire day's worth of music.

Sony's promise of connecting audio/video with the PC holds stronger appeal than, for example, AT&T GIS's link between the telephone and the PC. Actually, merging the PC and telephone makes a lot of sense, but once USB is here, it will be a relatively trivial task. (Note that though users can connect PCs and phones, these should remain two separate boxes. Nobody wants a telephone that crashes.)

Sony isn't the only company developing technology to bridge the gap between PCs and consumer electronics. IBM, for instance, has been showing (and will ship this month through Radio Shack) Aptiva PCs with Home Director, a PC-based remote controller of lights, coffeepots, and lawn sprinklers. Home Director is based on X-10, a 20-year-old technology that sends high-frequency pulses over household wiring to trigger $15 control modules. Oddly, the announcement came just as the more robust and somewhat more costly CEbus (consumer electronics bus) was about to come to fruition.

Unlike X-10, CEbus resists interference, and the controlled appliances can talk back to let you know if the appliances have actually been triggered. For IBM, X-10 may be a placeholder until CEbus really gets going next year. Compaq, for example, has already cast its lot with CEbus. As a longtime user, I think X-10 is useful, but I've always wished for something more reliable.

Keep your eye on two other vendors. Acer, Taiwan's top PC vendor, is moving strongly into the consumer electronics market. And though it has yet to be announced, we expect Toshiba will unveil an audio/video home PC this fall that will match or surpass Sony's initial offering. □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NETWORK EDITION

WEB SERVER-TO-DATABASE CONNECTIVITY

Grab That Data(base)

Web servers handle more than you may think. Make your Web server yield more fruit by connecting it to your database.

ILLUSTRATION BY MARK MATCHO

By John Garris

If you're deploying Web servers in your company, there's a good chance that sooner or later you'll use them to do serious application development. You might start out creating static HTML files spiced with .GIF images. But your Web server will handle much more complicated tasks—like providing access to your relational databases.

Many companies store much of their day-to-day business data in such relational databases as Informix, Oracle, or Sybase servers. Typically, users access this data under traditional client/server applications built with products such as PowerBuilder or Visual Basic. But with the right tools,

INSIDE

PC MAGAZINE

The expansion of the Internet into business has been a remarkably fast phenomenon. Not fast by Internet standards, of course. But light speed for business, which doesn't embrace change of any kind very quickly. So, fortunately, it's also been a good phenomenon. The Web server–Web browser combo is proving highly successful for delivery of all kinds of information.

NOW THAT WEB SERVERS have been turning interactive, the Web is about to engulf one of the last bastions of business's proprietary ownership—the database. In this issue, we review solutions from three leading vendors for accessing a relational database from a Web browser. Consultant and writer John Garris reviews software from Microsoft, Netscape, and Oracle, and finds three markedly different approaches to this challenge. (Also check out our complete comparative review of new database applications development tools in "Web Database Tools" on page 205 in this issue.)

IN FIRST LOOKS, project leader Alex Ho tests the claims of 10-Mbps throughput for a new infrared LAN product from JVC. The VipsLAN-10 results were comparable to those for a standard Ethernet wired connection. (Page NE23.)

NETWORKING CONSULTANT and contributing editor Steve Rigney reviews the latest edition of Artisoft's venerable LANtastic small business OS, Version 7.0. LANtastic continues to outclass peer-to-peer capabilities in today's broader-market OSs. (Page NE23.)

SO, YOU THINK IP is the be-all and end-all of network protocols? Think again, says senior networking editor Frank Derfler, think again. (Page NE30.)

—Gail Shaffer

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†*Ask your sales representative about Novell Netware.*

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June 25, 1996
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CIRCLE 924 ON READER SERVICE CARD

you can use Web servers and browsers to accomplish the same task.

In the process, you'll eliminate many problems with traditional client/server development—software upgrades and cross-platform support, for example. In this issue, we review three approaches to permitting access to database information from Web servers. We looked at Internet Database Connector (IDC), part of Internet Information Server (IIS) 1.0, and dbWeb from Microsoft Corp., LiveWire 1.0 from Netscape Communications Corp., and WebServer 2.0 and Designer/2000 from Oracle Corp.

We observed profound architectural differences in the vendors' approaches, which we've laid out in our reviews. We did not award an Editors' Choice, because we felt that each product is best suited to a particular market segment. Your best fit depends on the kind of Web applications you'll be creating and your in-house expertise.

Also, note that these products aren't alone in this market. Several third-party products, such as NetDynamics from Spider Technologies (415-969-6665), help link Web servers to databases. In addition, products such as Microsoft Web Assistant let you create HTML pages directly from within an SQL Server 6.5 database. The database automatically creates a formatted HTML page whenever specified fields get changed. Users can access that HTML page directly, without having to access the database in real time.

According to Your Business Needs

There's no best way to hook your Web servers up to corporate databases. Each of the three product sets we reviewed here solves the problem of Web database access in a very different way: the Microsoft products emphasize ease of use and simplicity, while the Oracle products leverage the company's existing database technology to work with Web protocols. Netscape's LiveWire, meanwhile, is a full Web development package centered around JavaScript, Netscape's scripting language.

The choice you make depends on the kinds of applications you're planning to write. Of the solutions presented here, LiveWire provides the best mix of functionality and ease of use. The LiveWire environment is focused primarily on the Web; there are built-in mechanisms to handle many of the problems of Web development, such as client persistence and permanent database connections. It's also a good choice for those fairly new to development: JavaScript is not a hard language to learn.

Microsoft's IDC is a good choice for Windows NT–only shops. It's built into IIS, which comes as a free add-on to Windows NT, and it's a simple chore to add database functionality to Web pages. Plus, IDC 2.0 will be out soon, with Microsoft Windows NT Server 4.0.

Oracle's WebServer and Designer/2000, on the other hand, are best suited for building large-scale applications. Those businesses already familiar with and invested in Oracle products will appreciate the Web extensions introduced in these products.

ADDING DYNAMIC DATA

The products we reviewed here break the static-HTML mold for Web servers and browsers. Some or all of the content they deliver is dynamically generated by the Web server in response to a request for up-to-date information. When a request comes in from a browser, the Web server queries the database and uses the results to format an HTML page on the fly; the page then gets sent to the requesting browser.

These products break the static-HTML mold for Web servers and browsers. Some or all of the content they deliver is dynamically generated.

The ability to create dynamically generated pages makes it possible to use Web protocols for a whole new generation of applications. Developers can write code that gets executed on the Web server. This code can query and update databases and perform other tasks. When the program is done, it sends results back to the browser as an HTML document.

Benefits extend to both your intranet and the Internet. On your external Web site, for example, you could build a customized shopping application in which a user fills out a set of preference fields that are stored in a database.

The next time that user logs on, the Web application performs a lookup on that user to formulate a customized set of Web pages that get sent back to that user. If the Web server is tied into existing customer and billing databases, a user's order requests can get processed immediately after the user submits an online order form.

HOW IT WORKS

The idea of accessing databases from a Web server isn't new, but the products here have made the process a lot cleaner. Traditionally, Web servers have used the common gateway interface (CGI) to handle Web requests involving database access. Essentially, the Web server called an external program on the server, which handled the database request and passed the desired information back through the Web server to the Web browser. This external program would open and close the database connection, query the database, and format the results in HTML.

The products in this review all bypass CGI and use more tightly integrated, higher-performance methods to connect to databases. Netscape's LiveWire is a Netscape Server API (NSAPI) application built on top of the Netscape Web server. Microsoft Internet Database Connector (IDC) is an Internet Server API (ISAPI) application integrated into the Internet Information Server (IIS). These APIs expose the innermost layers of Web servers, so applications writing to the APIs do not incur the performance overhead of applications using CGI.

Oracle's Web Request Broker (WRB) also bypasses CGI, although the underlying server interface is not published. The WRB lets software cartridges, either programming interfaces or packaged applications, run in conjunction with the Web server (see the sidebar "Beyond CGI").

WHAT YOUR DEVELOPERS SEE

We asked representatives from each of the three vendors to come to PC Labs for a full day to help install their products and build

Oracle Wins 11 of 14 Golds in Computerworld Application Tools Survey

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Best Technology

Oracle Developer/2000
Best Technology

Oracle Designer/2000
Best Service/Support

Oracle Designer/2000
Best Price/Performance

Oracle Designer/2000
Best Documentation

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Most likely to purchase

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Installed in Company

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When *Computerworld* surveyed 1,500 information technology professionals, they named Oracle's Designer/2000™ and Developer/2000™ their #1 choice in these application development categories. That's because Designer/2000 and Developer/2000 provide the most powerful tool suite for developing client/server and web applications, which scale from the workgroup to the enterprise.

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sample Web applications using their products. It soon became clear that each vendor approaches Web-to-database connectivity differently.

On one end, we found Microsoft's IDC to be rather simple. It accesses a script file containing information about the database request and an HTML-like template file to help format the results. Netscape and Oracle both offer full programming languages for developers writing server-side applications, although the languages themselves are worlds apart.

LiveWire uses JavaScript, which is similar to (but easier to learn than) Sun's Java. It is usable by IS managers and programming novices. Oracle uses PL/SQL, Oracle's procedural extensions to SQL, which is used to create Oracle stored procedures inside the database.

Although Microsoft's Web development solutions do not involve scripting, the company is working on such a product. Code-named Denali, it should be in downloadable beta form by the time you read this. Denali will let developers code in either Visual Basic Script or JavaScript and allow integration of ActiveX controls directly into the Web server.

We also looked at whether any of the Web servers support Java. The Netscape and Oracle Web servers, for example, let developers write Java applications that are then run on the Web server. These servers come with an integrated Java interpreter. When an incoming request points to a Java application, the server passes the request to the Java interpreter, which executes the Java application.

Currently, the uses of writing Java applications on the server are limited, partially because of performance limitations (Java applications are interpreted byte codes rather than OS-native code) and partially because of the lack of standards specifying ways to connect to database servers. That may change soon, however, as Sun's JDBC standard becomes more widely accepted (see the sidebar "JDBC: More Help from JavaSoft").

SOME OTHER CONSIDERATIONS

As you plan your strategy, consider a few other things. If you're expecting blazing performance when users access your Web application, remember that dynamically generated pages take longer to process than static HTML pages. With a static Web page, the server simply needs to grab a file on the computer's file system and send it to the browser. The process of querying a database and dy-

The Code of the LAN

The overall potential business benefits to enabling easier access to some of your company databases are pretty obvious. In the final analysis, of course, your Web developers will be the ones who deal with the finer details of the products in this story. Here, though, are some snippets of actual code we wrote in the lab during the day each vendor came out to help us write our sample application. These code snippets demonstrate just how different the scripting environment is for each product we reviewed.

```
.       (Code snippet from .htx file)
.
<center><H1>Here are the Employees!</H1>

<table border>
<tr>
<th><b>First Name</b></th>
<th><b>Last Name</b></th>
<th><b>Dept. No</b></th>
<th><b>Manager's Name</b></th>
</tr>

<%begindetail%>
<tr>
<td><%FirstName%></td>
<td><%LastName%></td>
<td><%DeptNo%></td>
<td><%MgrFirstName%> <%MgrLastName%></td>
</tr>
<%enddetail%>
</table>
</center>
.
.
```

```
Datasource: Web SQL
Username: sa
Template: empdump.htx
SQLStatement:
+ select * from employee,department
+ where employee.deptno=department.deptno
```

Microsoft Internet Database Connector (IDC) Here are pieces of two files—an .IDC script file (right) and an .HTX template file (left). The .IDC script is used by IDC to establish the database connection. The .IDC script file has parameters for the ODBC data source, the user name (and optional password), and the SQL statement, among other things. If query results come back, the IDC uses the .HTX file to describe how to format the results into a Web page. The .HTX file looks like a standard HTML file, with directives (such as "%begindetail%" and "%enddetail%") to indicate where the different field results go in the page.

```
<html>
<head>
<title>Employee Add</title>
</head>
<body>

<server>
var error = 0;
var employee = database.cursor("select * from employee", true);
employee.empNo     = parseInt(request.empNo);
employee.empName   = request.empName;
employee.deptNo    = parseInt(request.deptNo);
employee.mgr       = request.mgr;
employee.salary    = parseInt(request.salary);
employee.hireDate  = new Date(request.hireDate);
error = employee.insertRow("employee");
write("<P>New employee successfully added.");
</server>

<P>
<A href="home.html">Main screen</A>
</body>
</html>
```

Netscape LiveWire With LiveWire, developers do their coding in JavaScript. JavaScript statements are embedded in HTML files; the <server> and </server> tags mark the beginning and end of server-side JavaScript statements. To access databases, LiveWire provides a database object, with methods for connecting, querying, and closing a selected database. This code adds a record to an "employee" table, using user-typed input coming from an HTML form.

```
.       (Code snippet from PL/SQL file)
.
.

htp.htmlOpen;
htp.headOpen;
select emp_seq.nextval into eno
from dual;

select deptno into dno
from dept
where dname = ideptname;

select empno into mno
from emp
where ename = imgrname;

insert into emp values
       (eno,iname,NULL,ano,ihiredate,isalary,NULL,dno);
commit;

htp.print('Employee added.');

exception
  when NO_DATA_FOUND then
       if dno is NULL then
          htp.print('No such department!');
       elsif ano is NULL then
          htp.print('No such manager!');
       end if;

htp.headClose;
htp.htmlClose;
.
.
.
```

Oracle WebServer The Oracle WebServer works by letting developers create PL/SQL-stored procedures inside an Oracle7 database. These procedures interact with the database and return results in the form of HTML. PL/SQL is a procedural language based on Structured Query Language used specifically in Oracle products; most of Oracle's other development tools, such as Developer/2000, also use PL/SQL. The WebServer includes an "htp" object, shown at left, which lets developers create HTML pages directly from within PL/SQL-stored procedures.

—John Garris

Price check on four.

1	2	3	4
Compaq Proliant 4500	**Compaq Proliant 4500**	**HP NetServer LH2**	**AS/400 9402 4SE**
Pentium 166MHz	Pentium 166MHz	Pentium 133MHz	64-bit PowerPC AS
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And here's another surprise. According to an independent consultant's study[2] of American small businesses, AS/400 has the lowest cost-of-use over a five-year period. The study compares leading INTEL-based LAN server platforms to the 64-bit AS/400 and examines system, staffing and networking expenditures.

So if it's time to move up to a server, put AS/400 Advanced Series on your shopping list. Costs less to buy. Costs even less to own. If you'd like to know more, visit us at www.as400.ibm.com or call 1 800 IBM-4YOU, Priority Code GAS6B002 for a detailed information package including a copy of the IDC report.

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PC MAGAZINE EDITORS' CHOICE

June 11 1996
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CIRCLE 884 ON READER SERVICE CARD

namically inserting fields into an HTML page takes much longer.

Some products here do a better job of making that process quicker. Usually the most expensive part of executing a database query involves opening and closing a connection to the database. With the Netscape and Oracle servers, you can configure the products to open a database connection at server (or application) startup. All incoming requests then use that existing database connection, thereby improving performance. Microsoft IDC, on the other hand, opens and closes the database connection with each incoming request. (IIS 2.0, which will ship with Windows NT 4.0, will remedy this shortcoming.)

Licensing is another issue. In addition to product and in-house development costs, you will have to pay extra to give your Web users access to database data. Again, each vendor deals with this issue differently. With Microsoft SQL Server, you either pay a one-time $2,995 fee for unlimited Web access or use standard per-seat licenses to give individual users both Web and non-Web database access.

Netscape sells a version of LiveWire, called LiveWire Pro, which is bundled with Informix Online Workgroup Server. The server is licensed for unlimited Web access, but you can't use the same database for non-Web applications. Oracle's pricing is the most complicated, involving several variables, including Web and non-Web client licenses, and multiprocessor configurations.

Finally, you don't want to be unnecessarily tied into technologies that don't fit your company infrastructure. Netscape's products do well here. They offer good cross-platform support and interoperability with different database systems. Microsoft's solutions, though, work only with Windows NT; the Oracle WebServer works only with Oracle databases.

Know your project goals beforehand, and match the available tools to them. Some careful planning up front may mean the difference between a successful Web application and a costly nightmare.

Beyond CGI

By David S. Linthicum

Building Web-enabled applications using the common gateway interface (CGI) is a difficult process. Developers must deal not only with HTML but also with a low-level programming language. CGI does not provide state management capabilities, so it is difficult to make CGI applications follow traditional GUI application behavior. In addition, database interfaces must be hand-coded using the specific SQL dialect of a particular database server from the CGI program or script.

Thank goodness for new tools that provide Web application developers with easier ways to build applications and link to databases. New tools provide a layer between the complexities of Web development (CGI, HTML, Java, and others) and the application. These tools provide a visual development environment for assembling application components (list box, buttons, menu bar) on a form and adding behavior to those components using a high-level (4GL) programming language, or no language at all. Such tools also provide built-in links to databases (SQL Server, Sybase, Oracle), which provides for seamless, transparent database integration and avoids native database APIs, CGI, or APIs native to Web servers, such as NSAPI and ISAPI.

These development tools can take an application design (screens, controls, objects, behavior) and generate the required HTML and CGI code to drive the application. Moreover, they can layer into popular Web servers such as Microsoft's Internet Information Server and Netscape Enterprise Server. And they are accessible from most popular Web browsers, including Microsoft Explorer and Netscape Navigator.

A few good examples of development tools that hide the complexities of CGI and database APIs from developers are VisualWave, from ParcPlace-Digitalk (800-759-7272), and WebObjects, from NeXT Software (800-879-6398). Many others are about to emerge. Then there are the vast numbers of ActiveX and Java-enabled tools; with these the applications are driven from the client, not from the Web server.

VisualWave provides standard visual client/server development facilities. These include transparent links to a variety of database servers and object-oriented development using the 20-year-old pure object-oriented Smalltalk language.

Like other Web application development tools, such as Borland's Latte (800-233-2444), Powersoft's Optima++ (800-395-3525), and Symantec Café (800-441-7234), VisualWave is just a Web-enabled version of ParcPlace-Digitalk's client/server development tool, VisualWorks. Using VisualWave, a developer builds the application interface using VisualWave's Canvas Editor. Developers "paint" the interface by dragging and dropping GUI controls from an available palette.

You can add database controls as well, including data windows, query components, and reports. The Layout Editor automatically translates the interface design into HTML, and VisualWave uses CGI behind the scenes to interact with external resources such as HTTP servers. VisualWave provides the application with its ability to exchange information with the Web browser using HTTP and HTML. VisualWave supports advanced HTML extensions from Netscape and provides a local Web browser for application testing. Developers add application logic and database manipulation by using Smalltalk to extend the application objects.

Like VisualWave, WebObjects enables a Web developer to create an application visually, using existing NeXT development technology, such as Enterprise Object Frameworks. Web developers create the interface using WebObject's visual interface builder, which automatically generates the required HTML and CGI to drive the application. In addition, WebObjects goes beyond the limitations of CGI by providing developers with built-in state management capabilities transparent to the developer.

WebObjects uses the request-response model. WebObject applications contain several components, including HTML templates, declaration files, and script files. The HTML template files encapsulate HTML code, declaration files (which determine components that dynamically generate HTML), and script files, using the high-level WebScript language that allows developers to establish an application's behavior.

JDBC: More Help from JavaSoft

By David S. Linthicum

Java can do many things. It can make fish dance on home pages, display scrolling stock-market information, and even generate random data for Casino night on the Web. What Java cannot do well is connect to remote databases to create simple client/server applications. To connect to databases today, Java developers must either struggle with native database APIs, which were not designed for use inside of Java applets, or use nonstandard, proprietary, Java-enabled APIs from such middleware companies as Visigenic Software.

JDBC (Java Database Connectivity) from JavaSoft (415-960-1300) is the first cut of a standard Java-enabled database API. It promises to make linking applets to databases an easier process. Functionally equivalent to Microsoft's ODBC (Open Database Connectivity), JDBC provides developers with a uniform interface to most relational databases. The JDBC specification just completed a public review, and vendors are moving in to make JDBC a fixture in the world of Java. The JDBC API defines Java classes that let the developer connect to a database.

In most cases, this is an applet that links through the Internet or an intranet to remote database servers (Informix, Oracle, and Sybase). These JDBC Java classes allow the developer to issue SQL statements to request information from a remote database and process the answer set (data sent back from the database server). To the user, the Java applet functions like any other database application written in other languages, except that it runs inside a browser.

Two major components make up JDBC: the JDBC API and the JDBC Driver API. The JDBC API provides application–to–JDBC Manager communications, meaning that developers use this API to access database services using standard Java mechanisms. The JDBC Driver API provides JDBC Manager–to–database-driver communications on behalf of the Java applet.

The JDBC Manager, like the ODBC Driver Manager, loads and unloads database drivers as required by the Java applet. JDBC supports a connection to single or multiple database servers. Thus, an applet can connect to the customer database in the sales department, as well as to a public database on the Internet at the same time. JDBC works with ODBC by providing a JDBC-to-ODBC bridge to translate JDBC calls to functions recognizable to the ODBC API that is driven by procedural C.

Although JDBC and ODBC are similar, they take slightly different approaches to connecting to databases and so must endure the overhead of a translation layer. The ODBC connection is a requirement if JDBC is to support the innumerable relational databases when JDBC becomes a standard Java-enabled API. To further tie JDBC to ODBC, JavaSoft is teaming up with the ODBC middleware vendor, Intersolv, to create the reference implementation of JDBC using the ODBC interface. Sun understands that standards that diverge from popular products (such as ODBC) often fail to compete in an established market.

What JDBC lacks in shipping-product support, it makes up for in vendor support. Borland, IBM, Oracle, Sybase, and Symantec are just a few of the three dozen vendors that endorse JDBC. Java-enabled tools, such as Symantec's Café and Borland's C++ 5.0, will find that JDBC provides standard database connectivity that allows them to replicate traditional two-tier client/server development on the Web.

But keep in mind that JDBC is still in its embryonic stages and won't provide real value until major tool vendors build JDBC into their base Java development products. Microsoft is waiting in the wings with both its own database connectivity solution that uses ODBC directly, as well as the new Web-enabled ActiveX OLE component. Microsoft, though, is not likely to extend support for non-Microsoft environments. This leaves JDBC and Java as the best option for organizations wanting choices. Given the momentum that propels Java, it seems there is no stopping APIs, like JDBC, that add value to Java.

Microsoft Corp.

Internet Database Connector, dbWeb

ALL REVIEWS BY JOHN GARRIS

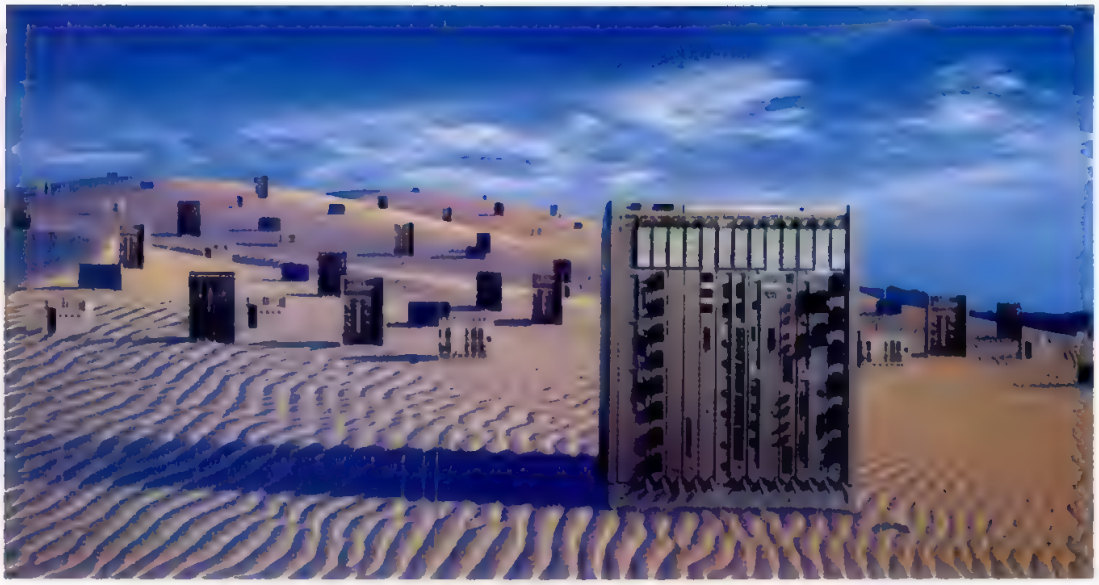
Although meant for different target audiences, both Microsoft products we looked at are intended to be easy to use. We found Internet Database Connector (IDC) a quick and easy way to add database data to Web pages. Compared with the Netscape or Oracle solutions, however, its lack of a full scripting environment is limiting. All in all, the IDC setup was the easiest of the three; we were ready to go in just over an hour. dbWeb, on the other hand, is designed for those who want nothing to do with databases—just the data in them.

We tested all the server-based products on a Microsoft Windows NT 3.51 system. First, we installed Microsoft SQL Server 6.5, then Microsoft Internet Information Server (IIS) 1.0. Finally, we configured an Open Database Connectivity (ODBC) connection in Windows NT to let the Web server communicate with the SQL Server (IDC can connect to any ODBC data source, although it does not support native connections to other databases such as Oracle or Sybase). We used Microsoft Internet Explorer 2.0 as the browser to view our application.

During testing, we first looked at IDC. It's actually an ISAPI application built directly into the IIS Web server, so we didn't have to do any additional configuration. IDC works by referencing .IDC script files stored on the Web server. These script files contain parameter information necessary to make the database connection—the database name, user name, and password, and the SQL statement itself. This script file is accessed in response to an incoming browser's URL string. If the string ends in .IDC, the Web server knows it is an IDC request and hands it off to IDC, which in turn reads the script file and interacts with the database.

After IDC gets query results from the database, it uses a separate HTML template file (.HTX file) to format the results inside a Web page. The template files are exactly like standard HTML files, except that they also include directives describing the way to insert query data into the page. For example, there is a directive that describes how to insert the different fields of a row into a page and to iterate through the

Less Is More.



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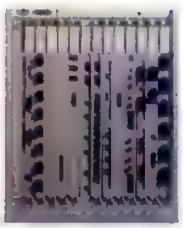

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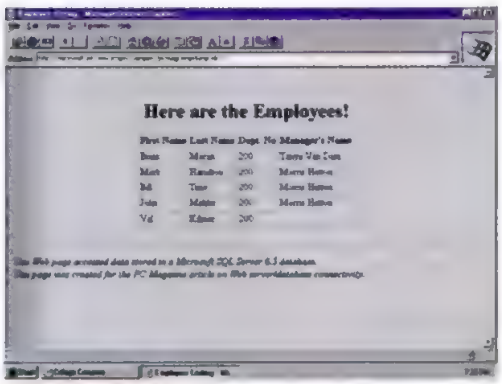
rows of a query result.

In practice, we found IDC easy to use. You need to know HTML and basic SQL syntax, but beyond that the concepts are quite simple. Unlike the Netscape and Oracle approaches, however, IDC doesn't introduce a full programming language in which you develop your Web applications. It's primarily designed for simple database queries.

With IDC, you are limited to one SQL Select statement per IDC script, although you can call a stored procedure on the database server to handle more complex queries. (IIS 2.0, which will ship with Windows NT 4.0, supports multiple Select statements.) Furthermore, you cannot maintain persistent database connections with IIS 1.0. Unlike the Netscape and Oracle solutions, the IDC opens and closes a connection with each incoming request. IIS 2.0 will fix this limitation and introduce other performance enhancements.



EASY AND FLEXIBLE *Using Internet Database Connector to format a Web page is easy, but it lacks full scripting.*

We also looked at another product from Microsoft called dbWeb. Unlike IDC, dbWeb is designed for people who know very little about databases or HTML, but who want to create well-designed Web pages incorporating database data. Using a graphical interface, you select your data source, tables, and the columns for your query and results pages. dbWeb then builds the queries and the HTML pages for you.

You can show results in free form (single record in detail) and tabular form (multiple records in row/column format), and you can create active hyperlinks from the returned data. We were impressed by the level of flexibility dbWeb offers. And it does a good job of hiding the complexities of database connectivity from the Web developer.

One thing to note, however, is that dbWeb is not currently supported by Microsoft. The only help you get is an unmoderated newsgroup. But it is available for free on the Microsoft Web site. IDC, on the other hand, has full Microsoft support.

Microsoft Internet Database Connector (part of Internet Information Server 1.0), List price: Freeware. **dbWeb.** List price: Freeware. Microsoft Corp., Redmond, WA; 800-426-9400, 206-882-8080; www.microsoft.com. *Circle 957 on reader service card.*

Web Server–to–Database Connectivity

	Microsoft Corp.	Netscape Communications Corp.	Oracle Corp.
Pricing and licensing	• Microsoft Internet Information Server (IIS) is downloadable for free from Microsoft's Web site and will be bundled with Windows NT 4.0. • A license for unlimited Web use of Microsoft SQL Server is $2,999, or use standard client licenses.	• FastTrack, $295; Enterprise Server, $995; LiveWire, $295; LiveWire Pro (with Informix OnLine Workgroup Server and Crystal Reports), $995. • A license for OnLine WorkGroup Server allows unlimited Web access (but no non-Web access).	• WebServer, $2,495. • A separate license for the Oracle7 database is required for Web access.
Platform support	• IIS runs only on Windows NT.	• Netscape Web servers run on Windows NT and several Unix platforms. • LiveWire runs on IRIX, Solaris, and Windows NT.	• WebServer 2.0 runs on several Unix platforms, and a Windows NT version should be available by the time you read this.
Ease of use	• Internet Database Connector (IDC) requires knowledge of HTML and SQL. • dbWeb is designed for novices; it requires a basic understanding of database concepts.	• JavaScript requires knowledge of programming principles. • Prior experience with Java or C++ is helpful. • Prior knowledge of SQL is strongly recommended.	• WebServer is designed for database developers. • Knowledge of SQL is essential. • Prior experience with Oracle products is very helpful.
Performance	• Database connections open and close with each database request.	• Database connections can be opened at application startup and kept live.	• Database connections can be opened at server startup and kept live.
Language support	• No server-side scripting environment is provided. • IIS provides an ISAPI low-level interface to the WebServer using C.	• The LiveWire environment is specifically designed for Web applications. • LiveWire is centered around the JavaScript language. Netscape Web servers also run Java applets on the server and provide an NSAPI low-level interface to the Web server using C.	• WebServer uses PL/SQL stored procedures in the Oracle7 database to generate HTML output. • WebServer's Web Request Broker (WRB) accepts both PL/SQL and Java applications as well as custom C and C++ applications written to the WRB interface.

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HAWK 2XL	ST32155	2.147 GB	Ultra SCSI 8/16 bit	up to 40 MB/sec	5411	9/10.5
HAWK 2XL	ST31055	1.050 GB	Ultra SCSI 8/16 bit	up to 40 MB/sec	5411	9/10.5

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HOW WE TESTED

Web Server–to–Database Connectivity

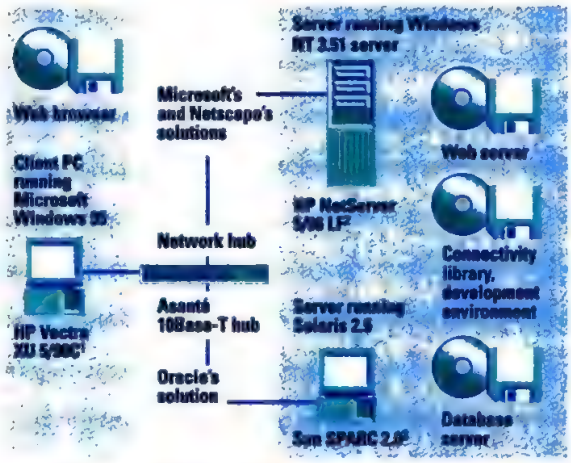
PC MAGAZINE LABS

Setting up a connection between your Web server and your relational database still calls for the right combination of software elements, but it's not nearly as complicated as it used to be.

Our table here lists the software elements involved in each solution we reviewed. Check out the Microsoft solution if you want to develop your Web database applications with drag-and-drop ease, or if you want to save time in code development and content creation. You can still write your own HTML source codes for your Web pages, but you may enjoy the option of code-free development.

Netscape, which also uses the Windows NT platform, offers LiveWire as the glue. LiveWire's Database Connectivity Library provides a direct SQL connection to relational databases from Illustra, Informix, Oracle, and Sybase, plus ODBC connections to other ODBC databases.

If you demand a robust, scalable architecture, Oracle's solution may answer your needs. We tested it on Solaris. By the time you read this, Oracle expects the Windows NT version of WebServer to be shipping.—*Analysis written by Alex Ho*



(1) Pentium/90 CPU, 32MB RAM, 10-Mbps NIC. (2) Pentium/66 CPU, 64MB RAM, 10-Mbps NIC. (3) SuperSPARC-11/75 CPU, 64MB RAM, 10-Mbps NIC.

TEST-BED: *Web server–to–database connectivity*

How We Tested

We asked each vendor to select an OS and software products to solve the challenge we presented. The test-bed systems and configuration are shown here. On each test-bed, we used the vendor's products to develop a simple Web application that would access data from the database server.

The application was a simple employee directory. Using a Web browser, a user would be able to add a new employee; search the database for a defined list of employee—salespeople, for example—and edit the information for an existing employee. When we simulated a user starting up the application under a Web browser, the home page would hyperlink to the database and allow the user to do one of two things: add a new employee or search the employee database. The user could also make changes, which would result in the editing of the database.

If the user clicked on the add-a-new-employee link, the Web server brought up a Web page with a form to record information about a new employee. Once the user hit the submit button, the application entered the information in the database and sent a response message back to the user. From there, the user would be able to go back to the home page.

If the user clicked on the search-the-employee-database link, the Web server brought up a form letting the user query the database. The user would be able to query on an employee's name, department, or manager. The result was a formatted table containing the name and department of all the employees matching the search.

On this page, the employee names were hyperlinked. When a user clicked on an employee name, a new page was generated with all the information about the given employee (name, department, manager, salary, hire date). This page also had an Edit button. When a user clicked on the button, a new Web page let the user edit the fields about that employee. The fields were initially populated with the current information about that employee.

Our test database contained two tables: an employee table and a department table. The employee table contained the empNo (employee number), empName (employee name), deptNo (department number), mgr (employee's manager), salary (employee's salary), and hireDate (hire date) fields. The department table contained the deptNo (department number) and dName (department name) fields.

	Microsoft Corp.	Netscape Communications Corp.	Oracle Corp.
Operating system	Server side: Windows NT 3.51 Server; client side: Windows 95	Server side: Windows NT 3.51 Server; client side: Windows 95	Server side: Solaris 2.5; client side: Windows 95
Web browser	Microsoft Internet Explorer 2.0	Netscape Navigator Gold 2.02	Oracle PowerBrowser 1.5
Web server	Microsoft Internet Information Server 1.0	Netscape Enterprise Server 2.063	Oracle WebServer 2.0
Database server	Microsoft SQL Server 6.5	Informix-OnLine Workgroup Server 7.12	Oracle7 Server 7.2
Connectivity library and development environment	IDC (part of Internet Information Server), dbWeb 1.1	Netscape LiveWire 1.0	Oracle WebServer 2.0

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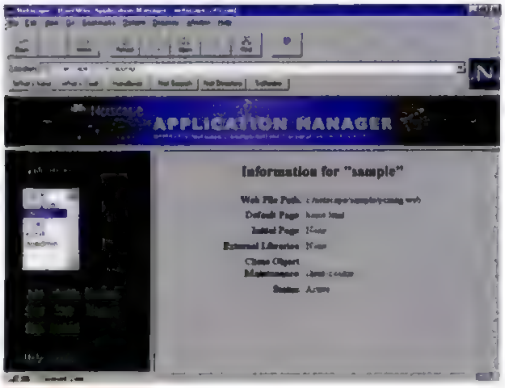
Netscape Communications Corp.

LiveWire

With LiveWire, Netscape has introduced a Web development environment that's both powerful and easy to use. Geared for the IS manager as well as the application developer, LiveWire provides a full development solution specifically designed to create server-side Web applications.

To set up our test-bed, we first installed the Netscape Enterprise Server 2.0b3 as our Web server (this late beta version proved stable during testing), then we installed LiveWire. Although it is included with Enterprise Server, LiveWire is also sold separately and contains the full Web development environment, including database connectivity libraries, Java-Script compiler, and Web site manager (the link checker). For our database, we used Informix OnLine Workgroup Server 7.12. LiveWire provides direct connections to Informix, Oracle, and Sybase databases, as well as ODBC connections for other databases.



SHOCKINGLY GOOD *LiveWire has plenty of power for applications developers but will appeal to IS managers too.*

Installation was quite simple. For each product, we simply clicked on a few dialog boxes and answered some basic questions. We used Netscape Navigator Gold 2.02 to view our sample application.

We created our sample application using LiveWire. LiveWire is built around JavaScript, a Netscape-created scripting language that resembles Java or C++ but is in many ways easier to learn. To build a server-side Web application, you embed JavaScript statements directly into standard HTML files using <server>. . .</server> tags. You can also write JavaScript functions in external files and reference those functions from within other JavaScript statements.

When you're done writing code, you run the files through a JavaScript compiler, which takes all the files and builds a separate application file (a .WEB file). The last step is to register the application with the Netscape Enterprise server. You must run your LiveWire applications using either the Netscape Enterprise or FastTrack server—you can't use another Web server instead. Once the application is registered, users can access the application by entering a standard URL assigned by the Web master.

Once we were used to the JavaScript language, creating our sample application was straightforward. The JavaScript environment includes a database object, which we used to open and close a database connection, and to query and update our database. For example, to open a database connection we used DATABASE.CONNECT. It took parameters such as the database name and type, user name, and password. We opened the connection at application startup—all database queries then used this existing connection.

To query the database, we used the DATABASE.CURSOR command. It took as a parameter an SQL Select statement and returned query results in the form of a cursor. We then used other JavaScript statements to insert our query results dynamically into a formatted table in an HTML page. We could also easily access information coming from the requesting browser (such as HTML form information) directly within JavaScript, which we found extremely useful.

Other JavaScript commands let you execute multiple SQL statements. You can commit or roll back an SQL transaction directly using JavaScript statements. You can also send native SQL commands to the database using pass-through SQL. You would use pass-through SQL for Inserts and Updates, data definition language (DDL) statements such as Create and Drop, and other statements supported specifically by the database vendor.

On the down side, the development environment is completely text-based. We did our work using Microsoft Windows Notepad. We would like to see visual tools to help automate development.

Netscape also sells LiveWire Pro, which consists of the LiveWire development environment bundled with the Informix OnLine Workgroup Server and Crystal Reports Professional. All in all, we were impressed by the LiveWire environment, for its power and its modest learning curve. It is a good solution for almost any environment.

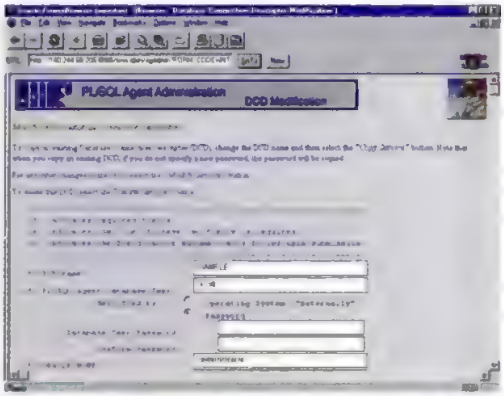
LiveWire. List Price: $295. Netscape Communications Corp., Mountain View, CA; 800-638-7483, 415-937-3777; fax, 415-528-4124; home.netscape.com. *Circle 956 on reader service card.*

Oracle Corp.

Oracle WebServer

Oracle products are geared to a different audience than those from Microsoft and Netscape. The major difference is in ease of use. Oracle WebServer 2.0 and Designer/2000 both involve a steeper learning curve and require a deeper understanding of database concepts. Oracle products, however, are a good choice for businesses already invested in Oracle that want to move existing client/server apps to a Web environment.

The first—and most complicated—part of our test-bed set was installing the Oracle7 database server. This was due in part to the operating system. We installed over Solaris, which required modifying some system parameters before we got the database running (a Microsoft Windows NT version of WebServer along with a number of other Unix versions should be out soon). WebServer itself, however, installed very easily. After running a separate program called



GREAT NEW TOOLS *Mainly geared for those already in the Oracle world, WebServer is quite powerful.*

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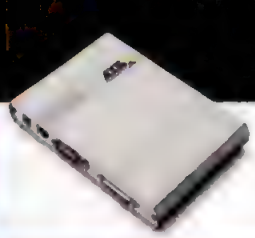

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CIRCLE 852 ON READER SERVICE CARD

Oracle Installer to copy files,we did most of our server configuration from Oracle's Web browser, PowerBrowser 1.5.

When you configure WebServer, you set up database connection descriptors (DCDs). These DCDs provide information that specifies how WebServer connects to the database; information such as user name, password, and Oracle database identifier are stored in the DCDs. Using WebServer, you can configure multiple database connections, and you can have them all opened at server startup.

For deploying Web applications, WebServer uses an architecture called Web Request Broker (WRB). WRB does two things. First, it internally manages multiple simultaneous connections to the Oracle database for higher performance. Second, it provides a programming interface (called the WRB API) to allow external cartridges to plug into WebServer.

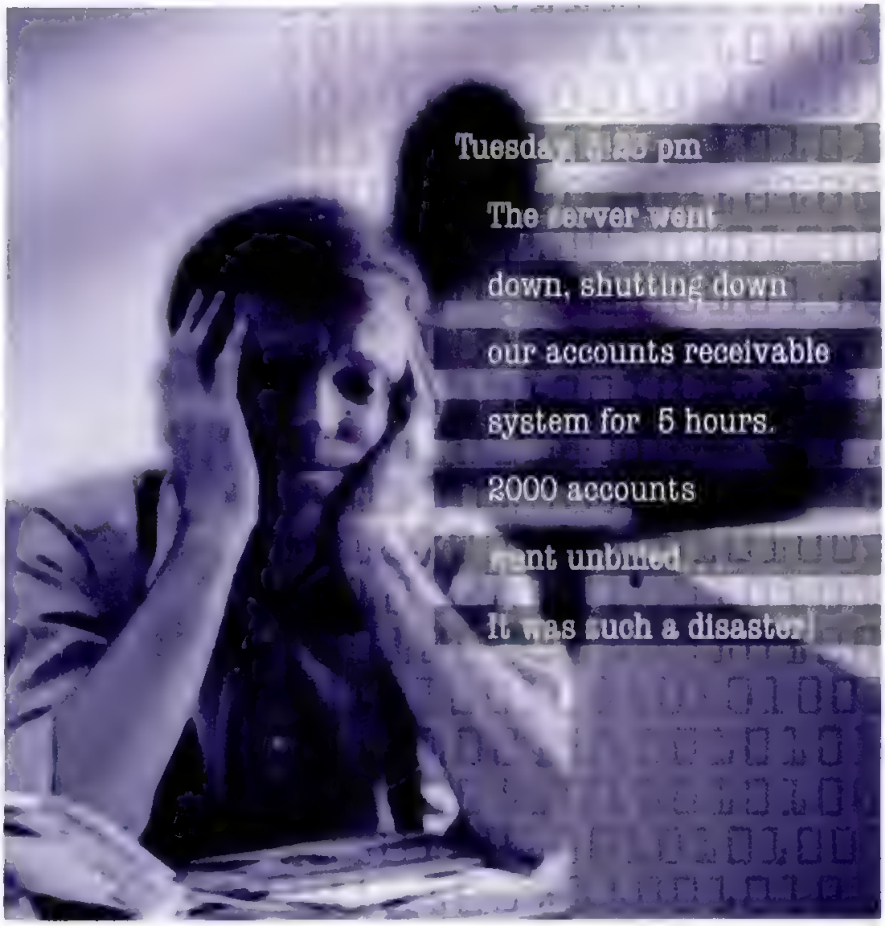
These cartridges can be either programming interfaces or packaged applications. By default, WebServer comes with a PL/SQL cartridge, a Java cartridge, and Oracle's implementation of the server side, LiveHTML. The Java cartridge lets developers write server-side Java apps; you can also call PL/SQL procedures from within your Java applications for database access.

We wrote our sample application using PL/SQL; that is, we created PL/SQL stored procedures that resided in the Oracle database. To access our application, WebServer parses an incoming URL string to extract both the DCD it uses and the stored procedure it needs to call. After it calls the procedure, WebServer returns the results from the stored procedure directly to the requesting Web browser.

Although we were able to create our application fairly quickly, we found PL/SQL more difficult to use than Netscape's JavaScript. Oracle developers, though, will feel at home: PL/SQL is used with a number of other Oracle tools, such as Developer/2000. We used a component of WebServer called PL/SQL Web Toolkit to generate HTML pages directly from our PL/SQL stored procedures. Web Toolkit provides a set of PL/SQL packages, which let you format your database data within an HTML document that gets sent back to the Web browser.

Designer/2000 is for the high-end development market. It costs $3,995, and the full product, which takes 400MB of hard disk space, also installs a number of non-Web development products on your hard disk. If you're already using Designer/2000 for existing applications, you'll appreciate the addition of the WebServer generator. This release, however, only lets you perform queries on your data. Look for the next version, which will also allow you to perform updates and inserts.

Oracle WebServer 2.0. List price: $2,495. Oracle Corp., Redwood Shores, CA; 800-345-3267, 415-506-7000; fax, 415-506-7200; www.oracle.com. *Circle 955 on reader service card.*



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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

WIRELESS LAN SYSTEMS

JVC Introduces the Infranet

By Alex Ho

If you think infrared technology belongs only in your TV's remote control, think again. JVC has now taken this technology to the world of networking with its VipsLAN-10, an Ethernet-compatible wireless system that uses infrared beams to replace cable connections in your LAN while retaining full 10-Mbps Ethernet speed.

The VipsLAN-10 is useful for situations where frequent network relocation is required, such as in a classroom. And it works well in manufacturing plants or hospitals where a wireless radio frequency solution is not feasible because of electromagnetic or health-care considerations.

A range of components, from a network hub to a PCMCIA network adapter, make up the VipsLAN-10. It comes with a one-year parts-and-labor warranty and is fully compatible with IEEE 802.3 and Ethernet II standards.

Installing this system is plug-and-play easy. All you have to do is replace your 10Base-T cables with JVC's infrared units. To achieve the 10-Mbps maximum throughput, JVC uses a proprietary narrow-beam infrared technology that isn't compatible with the IrDA infrared or the IEEE 802.11 wireless standards.

To verify JVC's claim of 10-Mbps throughput, we ran our ZD NetBench 4.0 NIC Throughput tests on the VipsLAN-10. Surprisingly, the VipsLAN-10's infrared connections results are comparable to those on the same test-bed connected with 10Base-T cables.

At the heart of this system is the ceiling-mounted cylinder-shaped infrared unit called the Satellite, which you can easily connect to your file server using a 10Base-T cable. The $1,355 Satellite uses an internal mirror reflection system and an array of 30 infrared photodiodes to transmit data through a 360-degree infrared beam.

Another crucial component of this system is the Node, which is connected to the hub. When you turn on the $935 Node unit and press the search button on the side of it, the Node automatically looks for an available Satellite. The Node has a motorized infrared sensor that scans vertically and horizontally to track down the guide beam emitted from the Satellite. Once the Node locates the Satellite, it locks on the position and establishes an Ethernet connection. If the infrared beam is obstructed for more than a few seconds, the Node goes into search mode to recover the connection.

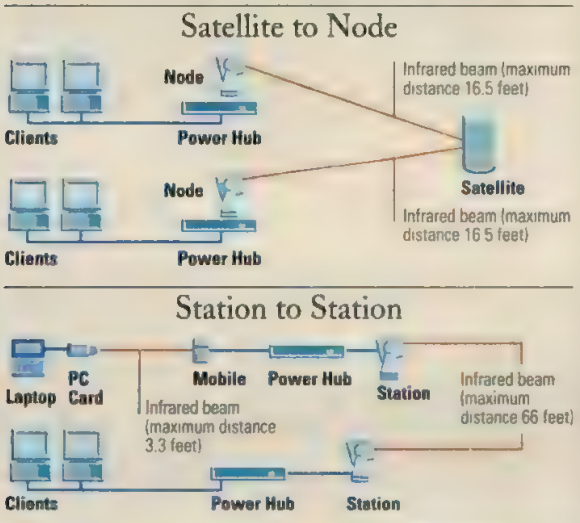
If the 16.5 feet between the Satellite and the Node is too short for your needs, or if the ceiling-mounted Satellite unit doesn't fit your office configuration, you can opt for the $955 Station. The Station looks and works like the Node but doesn't require the Satellite. A Station can establish a point-to-point infrared connection with another Station up to 66 feet away.

To connect laptop comput-

Continues on page NE25

Beam Aboard an Infranet

With the proper components, you can connect desktop clients, laptops, or both to the VipsLAN-10. For shorter distances, use the Satellite-to-Node setup. But if you can't hang objects from the ceiling or you need to cover more distance, consider the Station-to-Station connection.



PEER-TO-PEER NETWORKS

LANtastic 7.0 Delivers

By Steve Rigney

Even with the recent introduction of built-in peer-to-peer networks in many desktop OSs, LANtastic 7.0, the newest version of Artisoft's workhorse, is a product that can't be topped. In addition to letting you share hard disks and printers, LANtastic lets you share modems and Internet connections. So if you need a powerful network but can't afford a dedicated server at $499 for 10 users, LANtastic 7.0 is one of your best options. The product is a snap to use, and it offers strong security, basic network management, and such other utilities as e-mail, network chat, a remote-control host, and enhanced network printing.

The first thing you'll notice about the new release is LANtastic's improved installation routine. It automatically determines which OS you're running, detects your network adapter, and creates all icons. And a new one-floppy-disk installation utility saves considerable time on larger networks.

As for connectivity, LANtastic is one of the most flexible products on the market. We installed it on a PC running DOS, Microsoft Windows for Workgroups, and Windows 95. We connected all the PCs on the network and then connected to our Windows NT and NetWare servers. You can also hook up a PC running the built-in network in OS/2 Warp, Windows for Workgroups,

Continues on page NE26

INTERNET FIREWALLS

Simpler Firewalls Are ON

By O. Ryan Tabibian

As the number of private networks connected to the Internet grows, so does the number of firewalls. And as the number of firewalls grows, the price and difficulty of setup decrease. This is evidenced by the latest entry in the mushrooming firewall field, ON Guard from ON Technology. This product promises ease of use and simple management and configuration, and it doesn't require knowledge of Unix.

ON Guard is an Intel-based firewall that runs on a proprietary operating system called Secure OS32, a subset of DOS. The product is packet filter–based, which means every packet enters and leaves the network based on a set of rules defined by the network administrator.

A myriad of rules options are offered, along with extensive logging capabilities. There is also bidirectional firewall support, where administrators can disallow certain Internet services, such as Network News Transfer Protocol (NNTP). ON Guard also includes IPX firewall functionality.

The product comes preinstalled on a 486 PC with 4MB of RAM and two network interface cards (NICs). This configuration might not seem adequate when compared with Unix firewalls, but ON Technology representatives claim that by taking much of the operating-system functionality out of the proprietary OS—Secure OS32—they minimize the overhead of the server and eliminate the need for either a powerful processor or lots of memory. The product flew through most of our testing.

ON Guard is designed to allow users to install and configure it quickly and easily. The product also includes a management module that can reside on any Microsoft Windows–based PC on the network and perform all management and configuration of the product.

We easily installed and, using the management software, configured the firewall in our test network. We were impressed with the ease of use and extensive functionality of the management application. Because of this product's unique design, management is only performed remotely; users cannot perform any management from the firewall console.

But the product isn't without problems. Unlike Unix products, the console that runs the firewall doesn't contain any password protection. Though most of the configuration takes place using the management utility from a remote workstation, the security of the firewall can still be jeopardized.

In addition, any configuration change requires a reboot of the server. Products such as FireWall-1, from Checkpoint Software, can make all changes on

the fly, and they never require that you reboot the server.

ON Guard provides an intuitive utility for creating and managing basic rules. If you're looking to create more complex rules, however, the process can get quite complicated.

All in all, this is an interesting product for small to medium-size businesses that are looking to secure their networks against Internet users. But for larger organizations with T1 or faster connections to the Internet, a Unix-based firewall such as FireWall-1 is still the only viable solution.

ON Guard. List price: Software and hardware for 100 IP addresses, $6,490. ON Technology Corp., Cambridge, MA; 800-767-6683, 617-374-1400; www.on.com. *Circle 951 on reader service card.*

JVC

Continued from page NE23

ers that don't have a built-in 10Base-T network connector, the VipsLAN-10 offers a PCMCIA Type II infrared Ethernet network adapter called the PC Card. To connect your PC Card–equipped laptop computer to your network through infrared, use the $315 Mobile unit. Your laptop, however, will work only at a distance of 3.3 feet from the Satellite or Station.

To complete the VipsLAN-10 system, JVC provides the $450 Power Hub. The Power Hub is a six-port 10Base-T Ethernet-compatible network hub. When connected to the Node or Mobile unit, the Power Hub also supplies electric power to the unit via the 10Base-T cable.

CROSSTALK

"With its short range and high price, Frank, you've got to have a specific need for this system. True, JVC's engineers came up with answers to several problems, such as slow throughput, that have stood in the way of the success of other IR systems. But the range and price limitations mean you've got to have just the right fit."

Gail Shaffer

"If the wireless connection alternative is RF gear operating in the 2.5-GHz microwave-oven band, then I'd pay JVC's price for the IR system and avoid any psychological problems from the RF. Most RF and IR systems bridge a gap where you can't get a cable right-of-way, so the JVC Station unit with its 66-foot range should be popular."

Frank Derfler

JVC VipsLAN-10. List price: Satellite, $1,355; Node, $935; Station, $955; Mobile, $315; PC Card, $395; Power Hub, $450. JVC Information Products Co. of America, Irvine, CA; 714-261-1292; fax, 714-261-9690. *Circle 954 on reader service card.*

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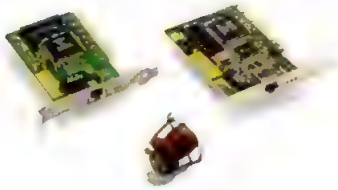

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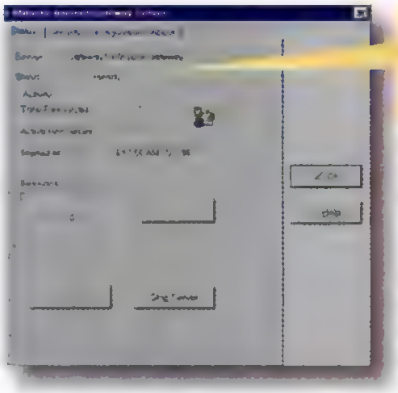
First Looks

LANtastic

Continued from page NE23

Windows 95, and Windows NT to a LANtastic server.

The two newest features, modem sharing and the Internet gateway, are outstanding. Modem sharing will save the expense of buying a modem for each user and installing separate phone lines. But only one person can use a modem at a time, so you may need to share several.



SHARE ALIKE: *Users can share an Internet connection via the gateway.*

The Internet gateway lets all users on the network share one Internet connection. A user can establish an Internet link and others can surf the Web without having to install separate modems or the TCP/IP network protocol on their PCs. But even a 28.8-Kbps dial-up connection slows to a crawl if multiple clients cruise at once. To make getting on the Internet easy, LANtastic includes the CompuServe/Spry Internet dialer, Netscape Navigator 2.0, and a built-in TCP/IP protocol stack.

The ability to control servers remotely from a single location is another of LANtastic's valuable tools. As for security, LANtastic lets you set up detailed user privileges all the way down to the file level. The Access Control Lists make it easy to control entire user groups that require the same access privileges. A time-saving security feature lets you make exceptions for certain users in a group without changing the security for the entire group.

The printing features are no slouches either. The advanced print job control allows you to print to any printer on the network, not just those attached to a file server. The utility is a 20K TSR that lets you attach as many as seven printers to a single client PC and share them on the network. This is a convenient way to place your network printers anywhere you want. **LANtastic 7.0.** List price: For 10 user licenses, $499. Artisoft Inc., Tucson, AZ; 520-670-7100; www.artisoft.com. *Circle 953 on reader service card.*

WEB SITE MANAGEMENT TOOLS

NetCarta Maps the Web

By Robert P. Lipschutz

Just as the number of Web sites in your bookmark file can multiply exponentially, a Web site also can quickly get out of hand. But help is finally on the way, and it has taken the form of WebMapper, Version 1.0, a Web site management tool that inventories and manages Web sites so you can rest easy.

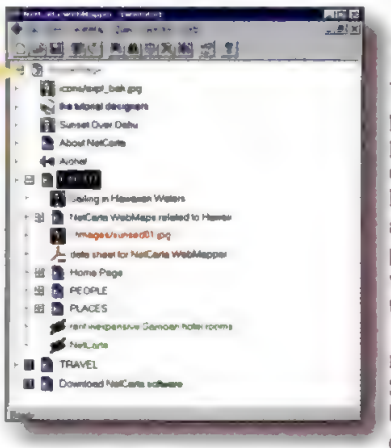
Tools are provided that allow you to see both the big picture and all the details on a site. For example, WebMapper creates and displays a blueprint of your Web site or someone else's, including a view of all files, graphics, and links. And WebMapper runs on either Microsoft Windows 95 or Windows NT 3.51.

Part of WebMapper's appeal is that it can effectively serve either Webmasters or power users. Webmasters can use it to keep track of all Web site files, find bad links, and get an overall profile of their own sites. Power users can use WebMapper to investigate and explore new sites.

Everything begins with a Web map, NetCarta's term for its collection of organized information about a Web site. You create Web maps by pointing WebMapper to a Web site that you access either on a local file system or through a URL.

WebMapper will search through the site, finding all HTML pages, graphics, and other files. But the actual files aren't downloaded. Only information about them is downloaded and then stored with the file's designated object in the Web map. For an HTML page, WebMapper will download the filename, title, file size, heading text, links, and in-line graphics referenced in the page. Still, this process can take a long time for large sites. You also can add your own information on site elements with the annotations tool.

MAPPED OUT: *NetCarta offers an organized Web site management scheme.*



Once the collection is finished, the Web map displays a hierarchical view of these objects starting with the home page and moving down, level by level. Objects are color-coded: Black means an object is on site; a green label indicates the object is not on the primary root traversed by WebMapper.

Using WebMapper, HTML pages can be opened in a favorite browser or viewer by clicking on the file object in the Web map. For such file types as .AVI audio files or video files, you need to configure WebMapper to use the appropriate viewer file. Once configured, the object is retrieved into this viewer.

One of the nicest features WebMapper offers is link verification. Both on-site and off-site links are checked. Broken links are labeled in red, and they show up both in the Web map and as broken links in the page's links property page.

WebMapper's search engine can help you find pages, images, links, or other objects. For example, you can search for image files over a certain size or find pages that include certain text as part of their headers.

And keep in mind that the power user can take advantage of these Webmaster benefits as well. When you're interested in knowing everything about a Web site, simply point WebMapper at the site and it downloads the information.

We would like to see a few key features added to WebMapper. For example, WebMapper can't handle pages protected by user names and passwords, even if you have the correct log-on names. If you have many pages with restricted access, this can be a show stopper. NetCarta says that the next version of WebMapper will have this capability.

We'd also like to see better reporting tools in the package. So much useful information can be gathered, but finding a nice, easily accessible way to display it proves to be a challenge.

The value of WebMapper, though, is not to be overlooked. It provides information that is at first just cool to know but that quickly proves its usefulness. **WebMapper, Version 1.0.** List price: $499. NetCarta Corp., Scotts Valley, CA; 800-461-2449; www.netcarta.com. *Circle 952 on reader service card.*

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New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Michelle Schoenung

Literally Anywhere

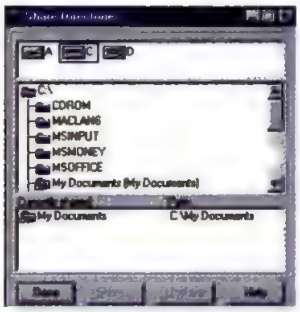
WITH THE MOST RECENT incarnation of pcAnywhere32, Symantec Corp. adds features that reflect the changing world of the remote user.

pcAnywhere32, Version 7.5, includes remote connectivity through the World Wide Web, which means that users can control host computers through the Internet.

There is now compatibility with a wider range of ISDN terminal adapters and support for the ISDN Accelerator Pack. There's also support for ISDN CAPI 2.0.

A new feature called Auto-Xfer transfers or synchronizes predetermined files or folders transparently. Version 7.5 runs on Microsoft Windows 95 and Windows NT and sells for about $149.

Symantec Corp., Cupertino, CA; 800-441-7234, 408-253-9600; www.symantec.com. Circle 961 on reader service card.



pcAnywhere32 *now provides remote access via the Web.*

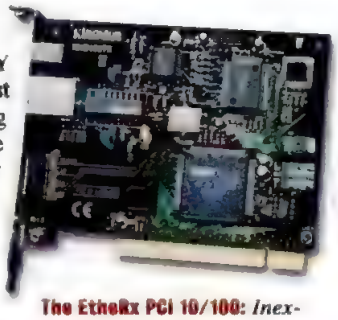
Kingston's Low-Cost Adapter

KINGSTON TECHNOLOGY Corp.'s **EtheRx PCI 10/100 Fast Ethernet Adapter** (starting at $139) offers a flexible and affordable connectivity solution.

The adapter provides full support for Windows 95 and Windows NT and features N-Way Auto-Negotiation, which automatically configures the adapter for 10 Mbps or 100 Mbps depending on line speed.

Kingston's QStart GUI configuration and diagnostic program is intended to make NOS configuration virtually automatic. The adapter comes with an extensive array of drivers for conversion to Fast Ethernet.

Kingston Technology Corp., Fountain Valley, CA; 800-845-2545, 714-435-2600; www.kingston.com. *Circle 959 on reader service card.*



The EtheRx PCI 10/100: *Inexpensive flexibility.*

PC/Mac Connectivity

MIRAMAR SYSTEMS **PC MacLAN** peer-to-peer networking software for Microsoft Windows 95 takes the indecision out of choosing between your PC and your Mac.

PC MacLAN ($199 for a PC license that can support up to ten networked Macs) lets both Macs and Windows 95 PCs share disk and CD-ROM drives, printers, and other resources in cross-platform network environments.

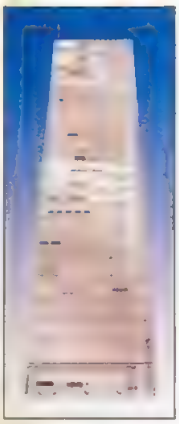
The software resides on the Windows 95 PC. No software installation is required on the Macintosh.

Miramar Systems Inc., Santa Barbara, CA; 800-862-2526, 805-966-2432; www.miramarsys.com. *Circle 960 on reader service card.*

HOT PROSPECT

Stackable Solutions

3Com builds on the success of its first two generations of stackable workgroup networking systems with the **SuperStack II.** Targeted toward local or remote workgroups of at least 15 users, the SuperStack II solution offers such features as port switching, graphics-based network management, hot swappability, and an uninterrupted power supply (UPS).



The SuperStack II Port Switch Hub ($1,499 for 12 ports; $2,199 for 24 ports) can be combined with the SuperStack II Port Switch Hub Hot-Swap Cascade Unit ($199) to allow for removal of components without bringing down the network. The SuperStack II Enterprise Monitor ($5,795 for 16MB version; $6,995 for 32MB version) now supports full integration of RMON. The SuperStack II 2000 Switch TR ($8,000) provides increased network capacity for Token-Ring. The SuperStack II UPS is available for $1,495 (an optional management module can be purchased for Ethernet, $699, or Token-Ring, $1,450).

All components can be monitored using the new Transcend SuperStack View software, which provides a single-screen graphical interface. **3Com Corp.**, Santa Clara, CA; 800-638-3266; 408-764-5000; www.3com.com. *Circle 964 on reader service card.*

OpenMind's New Rev

IF YOU'RE IN THE MARKET for an easy-to-install intranet solution, you may want to consider the latest version of Attachmate Corp.'s OpenMind team-collaboration software.

OpenMind 3.0 ($75 for the server, $50 per client) is a scalable Internet/intranet link that requires little programming.

Among the newest features is Attachmate's Emissary Desktop Browser technology, which supports advanced features of HTML 3.0. With an e-mail and NetNews Gateway add-on ($495), Version 3.0 supports MAPI 1.0 and is interoperable with Microsoft Exchange.

Attachmate Corp., Bellevue, WA; 800-426-6283, 206-644-1040; www.attachmate.com. *Circle 958 on reader service card.*

Mustang Introduces an Intranet Solution

BUSINESSES DESIRing to bridge the gap between the Web and their internal networks should consider **Wildcat! Interactive Net Server** ($1,495 for the Business Edition with 16 concurrent sessions, $3,995 for the Enterprise Edition with 64 concurrent sessions).

THE WILDCAT! *Interactive Net Server allows you to create a branded Web or intranet site.*

Billed as an intranet solution, Net Server lets users inside the firewall collaborate through Web, network, or dial-up connections. The Wildcat! Interactive platform also can be connected to the Internet, and users can surf the Web using the system's built-in browser.

The package includes e-mail, discussion groups, live chat rooms, document libraries, and an electronic-commerce gateway. The gateway allows companies to process sensitive billing information (such as credit card numbers) in a secure environment.

An extra feature in the Enterprise Edition offers Microsoft Exchange users access to messages without requiring them to log on to the Net Server.

Mustang Software Inc., Bakersfield, CA; 800-999-9619, 805-873-2500; www.mustang.com. *Circle 962 on reader service card.*

Remote Management

Kaspia Systems has introduced the **Kaspia Monitoring System** (systems start at $15,000), an automated discovery, monitoring, and reporting solution for network and remote management.

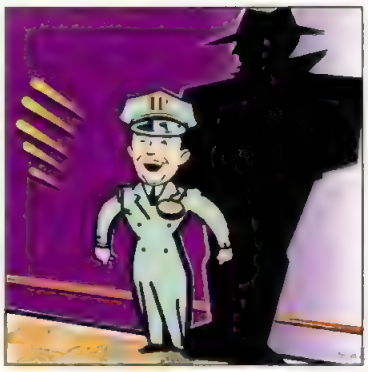
Using a single IP address, the system's Web-based Report Center generates daily reports on topics such as failure analysis and device maintenance. These reports can be accessed from any Internet browser or networked PC.

Kaspia Systems Inc., Beaverton, OR; 503-644-1800; www.kaspia.com. *Circle 963 on reader service card.*

MULTIPLE ACCESS By Frank Derfler

Think Twice About IP

A trip to Washington, D.C. and a visit from a Microsoft promotional team recently combined to set off my alarm bells. I went to my old Beltway stomping grounds to get briefings from NSA and DoD computer security experts. Their attitudes were frightening. They assume that the networks of most companies with "enemies" (that is, competitors) have been penetrated. They believe that penetration is the result of professional assaults aimed at finding out what the target companies know and what they're doing.



The threat from hackers with funny names is kid's stuff, but the threat from corporations and governments of all sizes is real. What was most frightening was that these assumptions were unstated. You were supposed to know these things like a physics student knows the big bang theory. I didn't.

A few days later, the Microsoft Windows NT 4.0 promo team came in and laid out one innocuous fact during their two hour pitch: Windows NT 4.0 Workstation uses IP as its default protocol. The government speakers had emphasized how easy it was to break into an IP network, and now Microsoft had made IP the default in its hot new operating system. Bong! Bong! Bong!

I am as enamored with the Internet and intranets as anyone, but I am not a fan of IP for every LAN. In fact, I think warmly about the old nonroutable SMB over NetBEUI Windows protocol combination. It's fast and simple, and with its simplicity comes security. Yes, its small packet size is inefficient when you send it across WAN links, but somehow everyone thinks that's cool with ATM!

Call me a Luddite, but my advice is to think twice or more before blithely putting IP on your LAN. First, when you install IP you open a portal for vermin to crawl through. Second, you use more memory on client PCs. Finally, you start an administrative mess involving subnet numbers and likely future changes to those numbers. I suppose that adding IP is a job security move for network managers, but it's a heck of a way to get it.

I suggest that you give your clients Internet and intranet access using gateways from Firefox, Novell, Performance Technology, or Quarterdeck. Performance Technology has led this group in doing away with previous limitations on NetWare client software. With its package you load one little software shim on each Windows client, then you can Alt-Tab and start up a browser for Internet or intranet surfing. No new IP stack, no memory hassle, and no security problems.

Even if you decide to use IP for some routed requirements, keep it off of your file and e-mail servers. Since many threats either really come from or appear to come from inside the organization, the concept of firewalls astride the Internet connection might not be enough. Consider establishing secured servers operating on NetBEUI only.

Today's professional intruders quietly copy your information assets and depart. Don't pave their road with IP.

ILLUSTRATION BY CHRIS SPOLLEN

PC NETWORK EDITION MAGAZINE PREMIER

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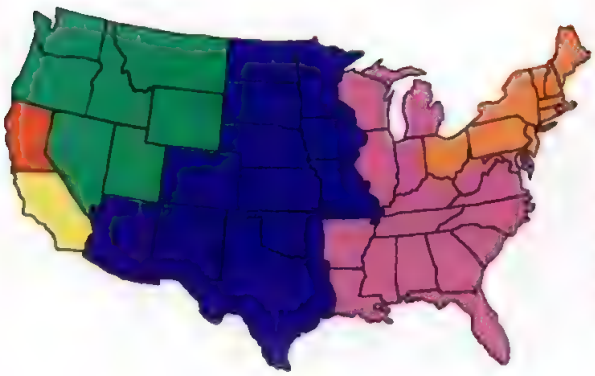

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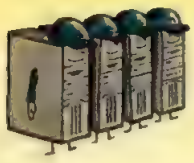

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IT'S TIME TO MSNBC GET CONNECTED

CIRCLE 121 ON READER SERVICE CARD

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let the environment adapt to you.
The voice inside whispers for you to start doing extraordinary things.
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TEXAS INSTRUMENTS

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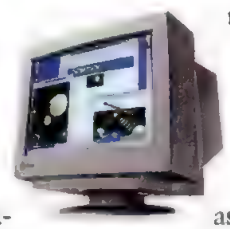

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Build Your Own WEB SITE

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PC ONLINE

From August 26 to August 30, join the staff of PC Magazine Online, including associate editor Tim Albano and technical associate Thomas W. Giebel, at *www.pcmag.com/discuss.htm* to discuss creating a Web site. Also look for links to free and evaluation versions of some of the products covered here at *PC Magazine*'s InternetUser site *(www.internetuser.com)*

WWW.PCMAG.COM

Bring yourself, your data, and your message to the World Wide Web. It's cheaper than other media and almost guarantees you a worldwide audience.

By Lance N. Ulanoff

Four years ago, Clinton campaign manager James Carville helped win the election by getting straight to the point with the slogan, "It's the economy, stupid!" Today, if we want to get straight to the point when it comes to computing, we might just as well walk around declaring, "It's the Internet, stupid!"

There's no hotter issue in corporate America than the Internet: how to get on it, how to use it, and ultimately how to profit from it. Hundreds of new World Wide Web sites are placed on the Internet daily by everyone from Fortune 500 corporations to enterprising college

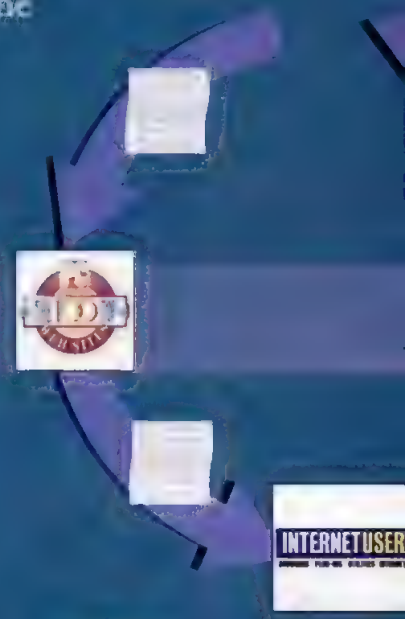
ILLUSTRATIONS BY TERRY MIURA

From Start to Finish: Building a Web Site

Whether your company wants to create a new Web site or you've been itching to build your own page, you need to know all the steps involved.

Think about ideas and design.
The very first thing you need to do is to decide how to present your ideas and information. Outline how you'll combine text with graphics elements.

Create your content
Now you need to churn out the HTML pages that will form your site. A good Web site includes attractive art, dynamic links to other sites, scrolling text, tables, forms, simple animations, and maybe even a few CGI and Java scripts.



Choose your server
In selecting your server, you have several good choices, including a Unix box (running on a SPARC with Sun server software) or a multiprocessing Intel box (running Windows NT and Internet server software).

Connect to an ISP
Through a router, tie your server to an Internet service provider (ISP) such as PSINet or UUnet Technologies. The provider assigns you an IP address, a series of numbers such as 128.8.32.128.

GRAPHIC BY DAVID FOSTER

students. Many potential users, though, have been left scratching their heads: Is it really that easy? Is it something we, as an organization, should be doing?

The number of companies with a Web presence is staggering, as is the number of those without. Agreement among experts is hard to come by, but CyberAtlas: The Internet Research Guide (*www.cyberatlas.com*) reports 300,000 distinct Web domains (this excludes personal pages).

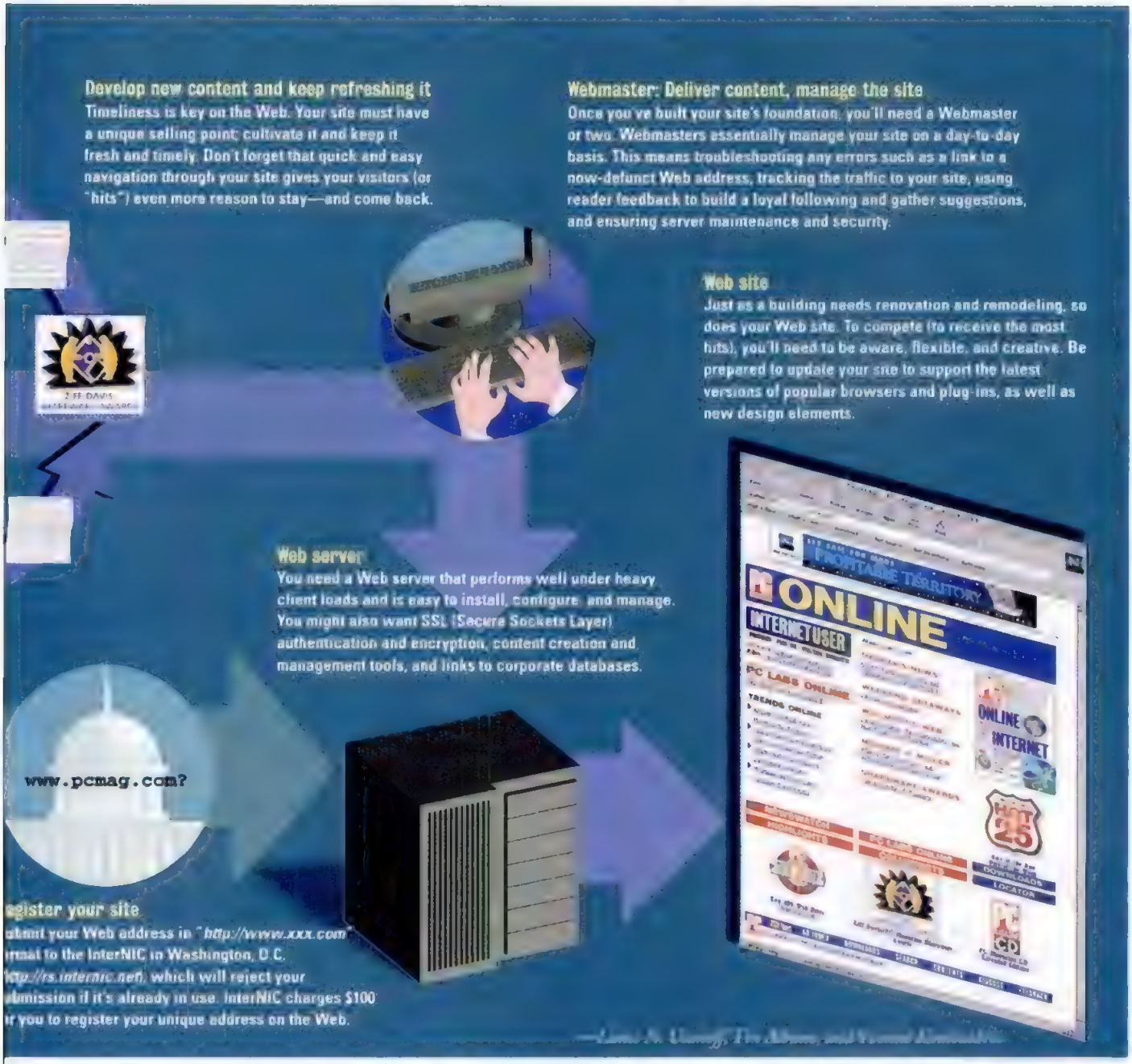
The reasons to become part of the Web are obvious. If you want to speak to a global audience, there's no better vehicle than the Internet and no more readily understood computer language than the idiom of the Web, HyperText Markup Language (HTML). A Web site—corporate, personal, or even internal—is your entrée to every connected home and office in America.

JOURNEY TO THE WEB

In this three-part story, we evaluate the software tools you can use to create and edit Web pages, to build interactive data-driven Web sites, and to manage your own Web server.

The first section, "Web Authoring Software," takes a hard look at the abundance of tools available for those who want to write HTML code from scratch. You'll find more than a dozen commercial products and dozens of shareware apps, all designed to help you put together HTML tags, graphics, colorful backgrounds, and other elements to create Web pages.

HTML editors have more in common with desktop publishing tools than with word processors, because HTML documents are usually for a broad audience. In this section we also look at HTML conversion tools—applets that take docu-



ments from some of your favorite applications and effortlessly convert them into Internet-ready format, complete with nearly all of your original graphics and design (or data).

DATA-DRIVEN

All such HTML documents, and associated files, must reside on a Web server, of course. In "Web Servers" we test ten products and also address issues relating to Web server management, including bottlenecks, the appropriateness of turnkey solutions, and free Web servers.

The Web is the first true global marketplace with data for making purchases, and that data is far more useful if it's live. Now database programmers can use some of their favorite tools to build data-filled sites that often look like catalogs or parts books. In part three of this story, we evaluate nine solutions.

THE WEB'S FACE

A typical Web page may feature attractive art, dynamic links to other sites, scrolling text, tables, forms, simple animations, and possibly a few CGI and Java scripts. Other enhancements, such as 3-D VRML, sound cool and often look great when they work, but they are nowhere near as prevalent as other Web technologies.

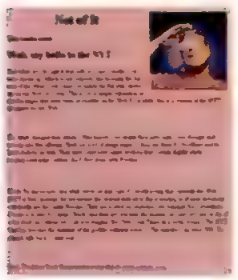
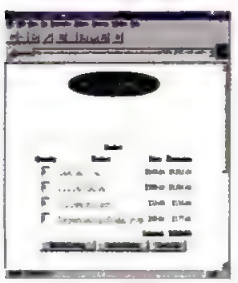
If you decide to do it yourself instead of having an Internet service provider

Our Contributors: LANCE N. ULANOFF is a senior associate editor of *PC Magazine* and the editor in charge of this story . TIN ALBANO is the associate editor of PC Magazine Online. YVONNE KOULOUTHROS is a staff editor of *PC Magazine*.

Options in Site Creation

The World Wide Web isn't really one-size-fits-all. Web sites must reflect their creators' personalities, corporate visions, or marketing goals.

Below you'll find information on four major Web-site types. We haven't included nonprofit sites *(www.name.org)*, sites maintained by educational institutions *(www.name.edu)*, or network services *(www.name.net)*; even so, they could well need the same tools that we describe. We've also tried to map out the cost, security requirements, and other maintenance factors for each kind of site. For more information about the products mentioned, check out the full product reviews that follow in our sections on HTML authoring, Web servers, and Web databases.—*LU*

	Description	Host	Tools	Security	Cost	Maintenance
Personal Web site 	A site that presents information about you and your interests. Personal photos, links to favorite sites, and personal creativity projects are commonplace.	You—though you may borrow server space from a major online service or even the company where you work.	A third-party Internet service provider or an online service. Best bets: CompuServe's Home Page Wizard, AOL's Personal Publisher, or HTML authoring and graphics tools.	Password encryption usually works best. Of course, most people put up personal Web pages for all the world to see.	Online service registration fee; $25–$300 for other software tools.	If you anticipate frequent visitors, you'll want to update your site's content on a fairly regular basis.
Corporate intranet Web site	A site of company information accessible to employees over the corporate network, via Web browsers. An intranet may also be used for group collaboration.	Corporate information services personnel.	HTML authoring tools. Best bets: Microsoft FrontPage or tools for HTML conversion, Web site management, Web server administration, and server-to-database connectivity.	Use the Web server–control features or those on your NOS. You can also try a corporate firewall, SSL, or other encryption tactics. Also, try to minimize external links.	$10,000–$1 million. The total depends largely on the number of pages, level of automation, and degree of maintenance necessary.	Employ a Webmaster, programmer, and graphic designer.
Commercial Web site	A site that presents a company image and information to current and potential clients.	Your company (an in-house Webmaster) or an outside virtual hosting service.	HTML authoring, graphics, and Web server tools. Best bets for Web server tools: Netscape Enterprise Server 2.0 and Microsoft Internet Information Server.	Use a corporate firewall.	$10,000–$1 million. Actually, some small companies are now announcing Web *starter* alternatives for less than $100.	Employ a Webmaster and graphic designer. Make sure new products are quickly (and accurately) presented on the Web.
Commercial data-driven Web site 	A site that presents a company image and information, allows queries, supports information and commerce, and enables live, secure transactions for purchases.	Your company or an outside virtual hosting service. You may need to maintain the database servers, though.	HTML authoring, graphics, Web server, and database tools. Best bets for database tools: NetDynamics and WebObjects.	Use Internet security and authentication, employ a corporate firewall, or access security features built into the database application.	$10,000–$1 million.	Employ a Webmaster, programmer, and graphic designer. Update and maintain data security measures on a regular basis.

Trouble locating your files?

File Management for Windows 95

Norton Navigator

A little organization can save you a lot of agony. Which is why Windows 95 users anxious to avoid the usual migraines will turn to Norton Navigator.™

Designed for Microsoft® Windows®95

Navigator lets you customize your Taskbar to provide instant access to frequently used applications and files.

PC EDITORS' CHOICE

It also lets you access and manage the files and folders you use most often right from within the application. You can rename, copy, delete and zip files to your heart's content.

If you frequent the Internet, you'll no doubt appreciate the ability to drag and drop directly from FTP sites to your hard drive.

And in the event you've done something you wish you hadn't, you can undo, unerase, uncopy or unmove multiple previous file operations from anywhere in Windows 95.

PC WORLD WORLD CLASS

So stay organized with Navigator. Because as we all know, a misplaced file or two can bring you a boatload of trouble.

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Creating Art That Works on the Web

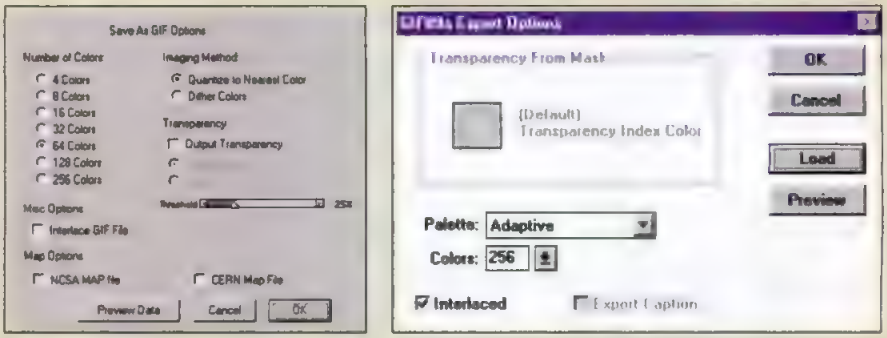
Thanks to the World Wide Web, the Internet is now an exquisitely visual place. Even so, the images at your favorite Web sites went through some pretty substantial manipulations before they made it onto the Web.

SMALL IS BETTER Start by saving your images in either .GIF or JPEG compressed image (.JPG) format. These two file types are the most widely recognized on the Web. Your image must fit in a 640- by 480-pixel screen, the size at which most Web browsers currently run. More important, smaller art means decreased file size. Remember, most visitors to your site will be using 14.4- or 28.8-Kbps modems; even with a T1 line, graphics over 100K can really increase download times, trying your visitors' patience. If you want your art to cover the screen (or serve as an exotic background), that's fine; just make sure the file size remains relatively low.

FEWER COLORS Using fewer colors means decreased file size and faster downloads. No, we're not saying that black and white is the way to go. Thanks to the intelligent features in a host of graphics applications and utilities, it's a snap to reduce a 16.7-million-color graphic to a manageable 256 colors (or fewer) while losing little image quality.

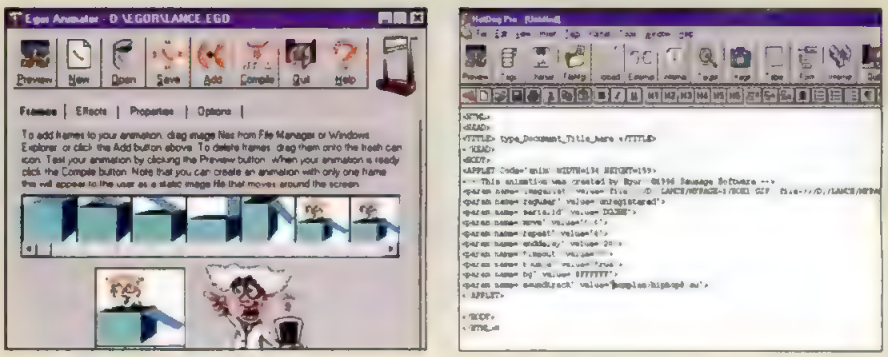
WORKING TOGETHER The more images you have, the more colors you're likely to introduce to your site. Even at 256 colors, you will not necessarily use the same ones for each graphic, and this can result in jarring color shifts as your visitors navigate from page to page. Try preloading a palette; you can do so with Adobe Photoshop. It lets you take all of your images, put them in one file, and create a master palette file from that one. Another solution is to try maintaining a consistent palette as you design.—*LU*

PAINTER AND PHOTOSHOP

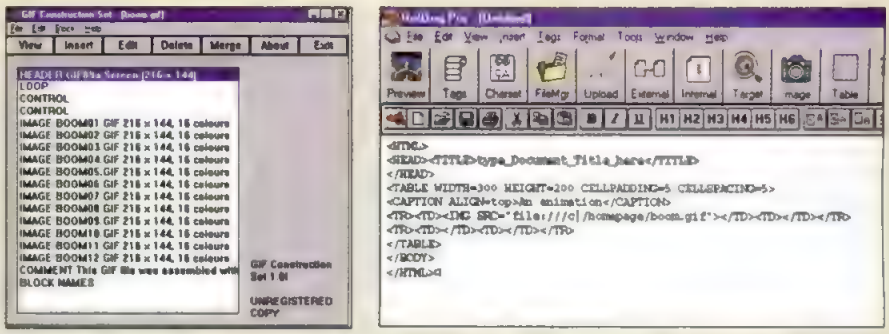


Fractal Design Painter, $549 list, from Fractal Design Corp., offers one of the most complete screens for GIF89a file-saving options (left), including preview. You can dither your image in 4 to 256 colors, set transparency color, make your file interlaced, and even create an image map. **Adobe Photoshop 3.05,** $895 list, from Adobe Systems, also has strong .GIF output options (right).

.GIF ANIMATION TOOLS

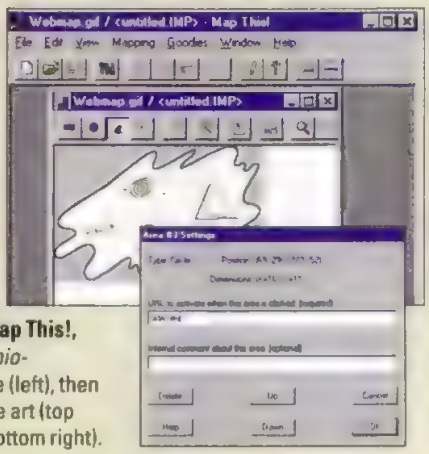


Egor, $50, from Sausage Software (*www.sausage.com*), uses a drag-and-drop metaphor to create .GIF animations (left). Once you're satisfied with the animation—you can loop it, add sound effects, and preview it—you export the HTML code and dump it into your HTML editor (right). Egor does not combine or manipulate the individual .GIF files.



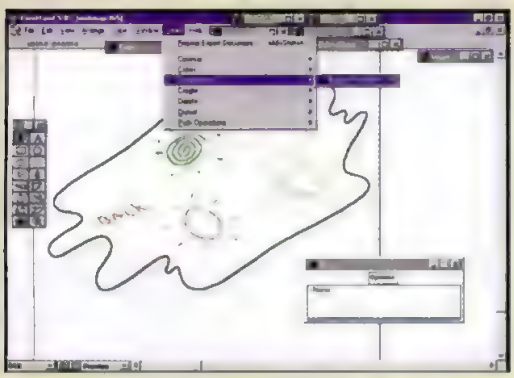
GIF Construction Set, $20, from Alchemy Mindworks (*www.mindworkshop.com*), is a little less graphical than Egor but is simpler to use. You import all of your .GIFs into the main screen (left), insert controls, and compile the animation. Everything comes out as one file that you simply point to in your HTML source code (right).

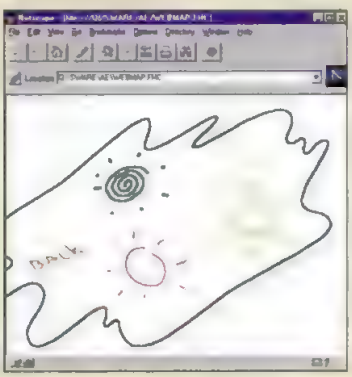
IMAGE MAPPING



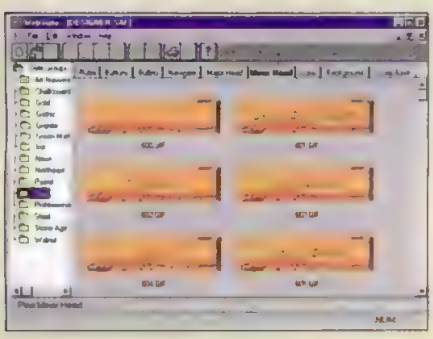
Among the emerging tools for image mapping is **Map This!**, freeware from Todd C. Wilson (*galadriel.ecaetc.ohio-state.edu/tc/mt/*). Start by importing any .GIF image (left), then define the area you want to use for hot spots on the art (top right). For each hot spot, you must specify a link (bottom right).

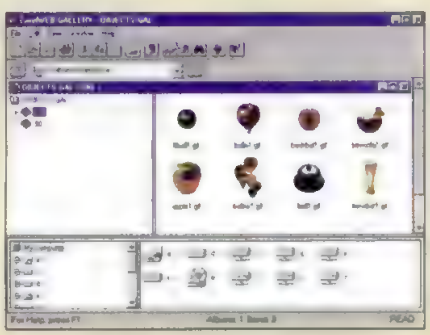
MORE GRAPHICS





Products such as **Shockwave for FreeHand** and **Director** (above), freeware from Macromedia Corp. (*www.macromedia.com/Tools/Shockwave*), let users place vector-based illustrations and compressed Director files on the Web. Users need the Shockwave plug-in to view them.





You don't have to create all of your own art. **DigitalStyle WebSuite Designer Edition,** $199, from DigitalStyle Corp. (*www.digitalstyle.com/text/other/whatsnew.html*), has a substantial collection of prebuilt buttons, banners, and other Web-ready art. **CorelWEB.Gallery,** $99 list, from Corel Corp. (*www.corel.com*), offers perhaps the largest collection of prebuilt Web art objects.

OTHER TOOLS

ABC Quicksilver, Micrografx, *www.micrografx.com/products/quicksilver/quicksilver.html*

Alchemy, Next Wave Software; *www.stormsurge.com/alchemy/*

ASAP WebShow, Software Publishing Corp., *www spco com/*

CelAnimator, FutureWave Software, *www.futurewave.com*

CGI*Star, WebGenie Software; *www.webgenie com/webgenie.html*

Color Manipulation Device 2.0, FLUX; *www.meat com/software/cmd html*

Crosseye, Sausage Software; *www.sausage com*

Fractal Imager, Iterated Systems; *webber iterated.com/fractimg/*

FutureSplash, FutureWave Software, *www futurewave com/*

HTML Color Reference, Christopher Fazendin; *www.winternet com/~faz/*

HVS Color, Digital Frontiers; *www digfrontiers.com/*

Hyperwire and Topper, Kinetix (a division of Autodesk), *www.ktx.com/*

Liquid Motion, DimensionX; *www .dimensionx.com/*

LView Pro, MMedia Research; *world .std com/~mmedia/lviewp.html*

PowerApplets, Macromedia; *www.macromedia com/Tools/PowerApplets/Info/index.html*

VuePrint, Hamrick Software; *www.hamrick com*

WebEd Image Mapper, Kevin Read; *www.o.emar.com.au/80...kread mapper.html*

WebForms, Q&D Software Development; *www.q-d com/wf htm*

Web Hotspots, 1Automata; *www.cris .com/~automata/hotspots shtml*

WebImage, Group 42; *www.group42 com/*

Weenies, Sausage Software; *www sausage com*

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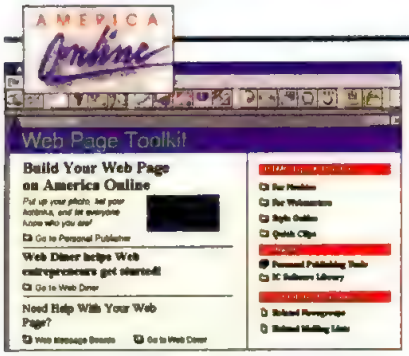
CIRCLE 082 ON READER SERVICE CARD

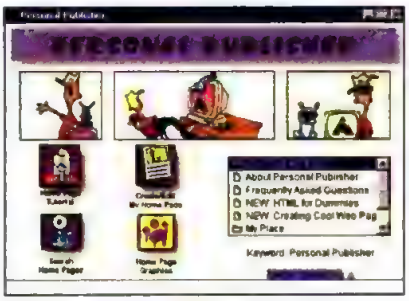
Using an Online Service to Build a Personal Site

By Yvonne Kolouthros

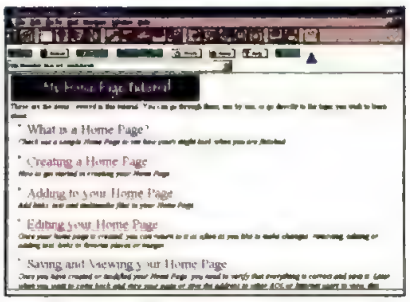
Creating a personal Web page needn't involve HTML editors or other advanced tools. The online services America Online, CompuServe, and Prodigy offer their own wares for personal Web page creation. We take a look at the steps involved in using each service.



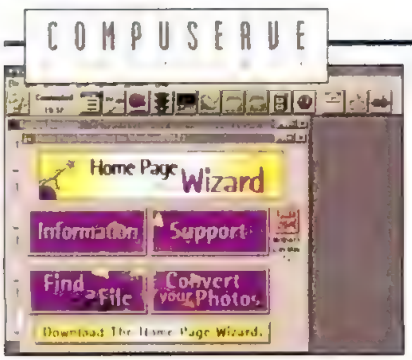
To get to America Online's Web Page Toolkit, simply type "HTML" as the keyword; from there, you can go straight to Personal Publisher.



Here, a "home base" screen pops up, where you can choose to go to a tutorial, create/edit your home page, go to My Place, or use Advanced Tools.

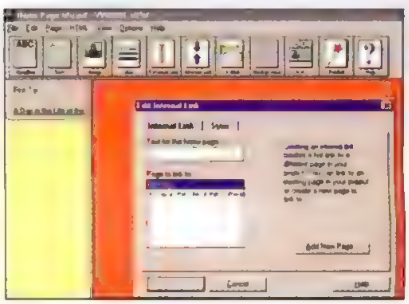


Home Page Tutorial gives step-by-step instructions. It also starts off by asking for optional information about you, which forms your page's basic elements.

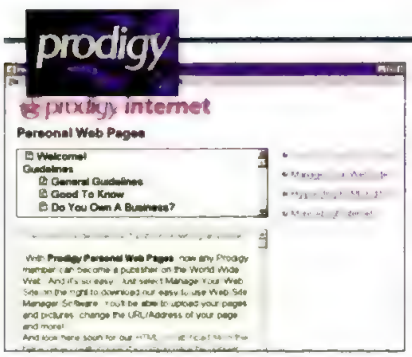


Type in "GO HPWIZ" and you'll find yourself at CompuServe's Home Page Wizard. Here you'll get 1MB of hard disk space for creating your Web page.

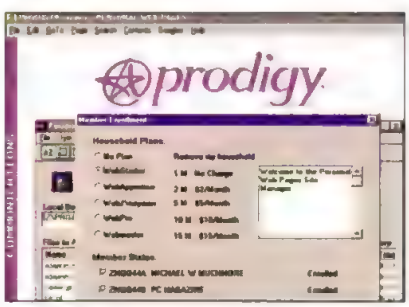
Home Page Wizard's easy-to-understand toolbar and buttons let you effortlessly create a Web page in minutes. The choice of images is limited, though.



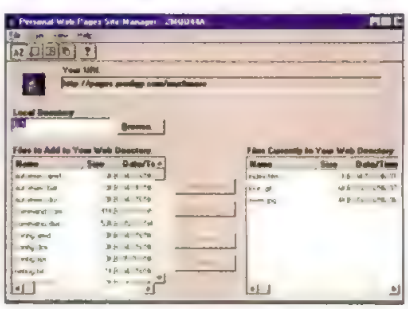
Creating your own internal and external links is easy. CompuServe keeps track of it all in the left-hand column shown here.



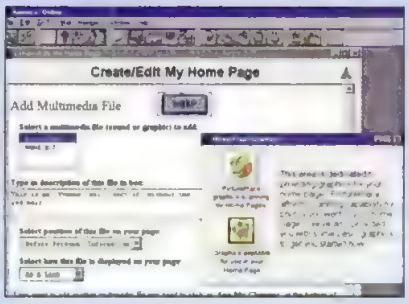
Go to the jump command and type "Personal Web Pages" or "PWP." Once there, you can "manage your site" or try to download the Hippie HTML editor.



In Prodigy's member enrollment dialog box, you find that WebStarter comes with 1MB of hard disk space at no charge. There are also more advanced, fee-based options.

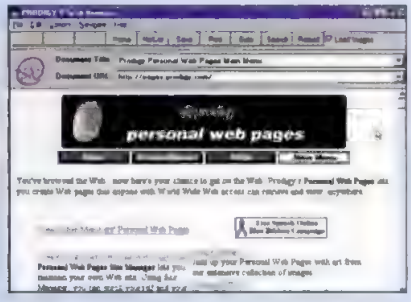


Prodigy offers a dialog box that lets you add files to your Web directory. Once you've uploaded the files, Prodigy automatically publishes your Web page.



When creating/editing My Home Page, you can add text to multimedia files. AOL will automatically publish your pages, on either a public or a password-accessible basis.

Once you've tested your page using Spry's Mosaic Web browser (at press time, bundled with CompuServe), you can simply click on the toolbar's Publishing Wizard.



When you choose to view personal Web pages, Prodigy connects you to its own Web site. There you'll also find links to HTML editors.

(ISP) create your Web site for you, you'll find that the tools are available and surprisingly easy to use. The illustration "From Start to Finish: Building a Web Site" details the paths you might take to launch a site of your own.

An ISP can make the process incredibly short and simple but potentially expensive. You provide the content, and the ISP builds the art and links, performs the coding, and posts the site up to a server (yours, the ISP's, or that of a large, third-party ISP). For launching a fully formed, high-tech Web site that includes art, mail, database connections, Java scripts, global chat, and more, prices can range from $4,000 to $8,000. (Some say costs can run as high as a million dollars.) And that's just for the launch. Maintenance usually involves an additional $500 to $2,000 a month (depending on the type of connection).

> If you want to speak to a global audience, there's no better vehicle than the Internet and no more readily understood computer language than the idiom of the Web, HTML.

While all this may sound expensive, keep in mind that the World Wide Web may provide you with a global audience and with millions and millions of possible customers. If most media outlets charge around a dollar per head—well, you can do the math.

BUILD IT AND THEY WILL COME

For Web-It-Yourselfers, the cost may be somewhat less. But the development path is more involved, and there's the cost of hiring new personnel to create content and manage and maintain the site. Webbing it yourself doesn't necessarily mean you do it all. A *Webmaster* is the person who knows every HTML spec from Version 1.0 to 3.2, what a .GIF transparency is, how to manage FTPs, what HTTP stands for, and how to post data up to your Web server. Webmasters are the essential link in the chain between Web sites and patrons.

What if you want to become a Webmaster yourself? You could think of these stories as your first semester of Webmastering 101. Start by using the information grid ("Options in Site Creation") to pinpoint the kind of Web site you plan on designing: Which audience will you be serving? What kind of information do you plan on maintaining there? If you're aiming for a personal Web site, check out our brief look at creating a site with the able guidance of one of three online services: America Online, CompuServe, and Prodigy. And whether it's a personal page or a corporate Web site, a perusal of "Creating Art for the Web" will help you to understand the Web's art limitations, favored Web file types, and new tools to help you make attractive sites with a minimum of fuss.

COMING SOON

What's next? Better multimedia over the Web is already happening: Tools from Micrografx and Macromedia have opened the Web to new graphics file formats and animation, and Java developers should take animation and interaction to the next level. Other companies are developing compression/decompression schemes to stream full-motion video over the Web, and live sound (often from radio stations around the country) has become almost commonplace. Granted, the quality of sound (and video) on the Web still leaves much to be desired. Nevertheless, those creating Web sites should start thinking about how they'll eventually implement these next-generation technologies.

When you've completed your first Web site, index it on 29 World Wide Web directories and search sites (excluding the HOME TEAM engine) simply by registering at Submit-All (*www.hometeam.com/tools/submital.htm*). It's an easy, inexpensive, and effective way to gain high visibility quickly for your nascent site.

All that follows provides a complete picture of cradle-to-*rave* Web development. Just remember, when someone asks you what the big deal is, you can just smile and say, "It's the Internet, stupid." □

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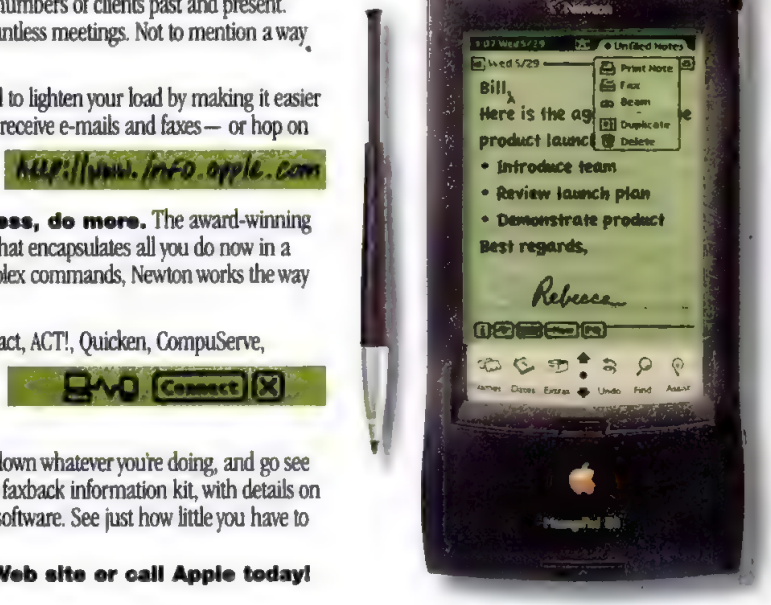
Dozens of new and well-known applications, such as Now Contact, ACT!, Quicken, CompuServe, Meeting Maker, and Eudora Pro, are available for Newton, with more coming. Making it easy to transfer information to and from your PC.



Pick up a MessagePad and get going! So put down whatever you're doing, and go see the Apple MessagePad 130 at your nearest dealer. Or get our faxback information kit, with details on the complete line of MessagePad products and the latest software. See just how little you have to carry, to have it all.

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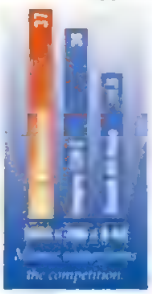

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* Estimated street / selling price for the 2MB version. Windows 95 tests conducted by Matrox Graphics Inc. using Ziff Davis Winbench 96 on a Gateway P5 166MHz 16MB of RAM and 256K cache at 1024 x 768 in 256 colors, 72 Hz. large fonts under Windows 95. The Matrox MGA Millennium and Diamond Stealth 64 Video were were configured with 2 MB of memory and the Number Nine Imagine 128 2 was configured with 4 MB of memory for the PCI bus using driver releases 3.01, 4.02.268 and 2.09 respectively.

CIRCLE 381 ON READER SERVICE CARD

Web Authoring

A new generation of Web editors gives you a firm grip on the complexities of HTML syntax. Some are ultrasophisticated coding tools, while others hide the code altogether.

By Sharon Terdeman

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InContext Spider 1.2 146
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For updated news, reviews, and performance results of Web authoring tools, visit InternetUser at PC Magazine Online (*www.internetuser.com*). From August 26 to August 30, you can join an online discussion about Web authoring products and technology at *www.pcmag.com/discuss.htm*.

WWW.PCMAG.COM

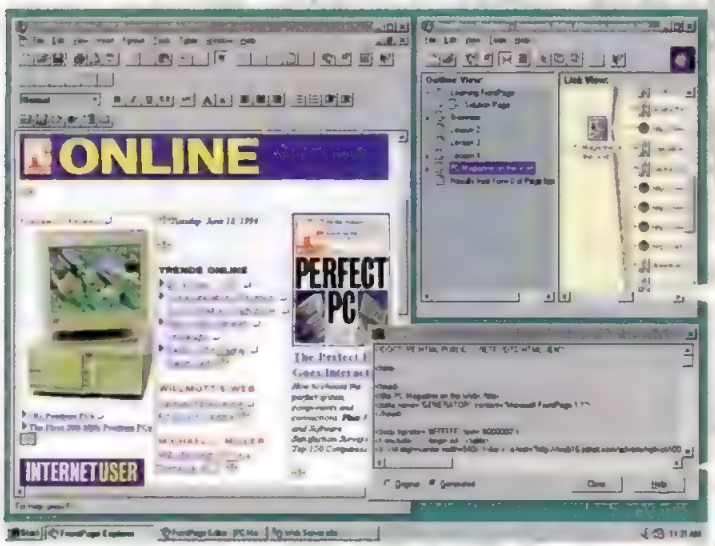
It's ironic that as the Web has democratized global communications for millions, its basic hypertext markup language (HTML) has evolved from a simple set of easily readable tags into a forbiddingly esoteric syntax. Web authoring used to require little more than a text editor. Today even the most expert page designers and Webmasters are likely to depend on specialized HTML tools.

Luckily, as quickly as pages are proliferating on the World Wide Web, so too are the tools available to produce them. Last year's roundup (October 10, 1995) looked at 5 HTML editors. In this review, we evaluate 16, culled from an initial list of over 50. (We didn't review some major products, such as Adobe's PageMill, because the Windows versions were not yet available.)

Not only has the number of tools increased, the products them-

Graphical or Code-Based? Two Approaches to HTML Authoring

As HTML gets more complex, the trend is toward graphical authoring environments. But many experts still prefer the extra control offered by code-based tools.



GRAPHICAL TOOLS

With graphical tools, such as Microsoft FrontPage, you work with text, images, and other page elements in a WYSIWYG environment much the way you would with a modern word processor (left). You use toolbar buttons to insert elemants—not tags—into your document. The HTML is generated automatically behind the scenes and stays hidden from view. What you see is close to what you get (but not exactly).

Some tools (both graphical and code-based) provide site management features that let you visualize and check the links in your site and manage their relationships. This can be helpful to users who want a complete solution in a single package.

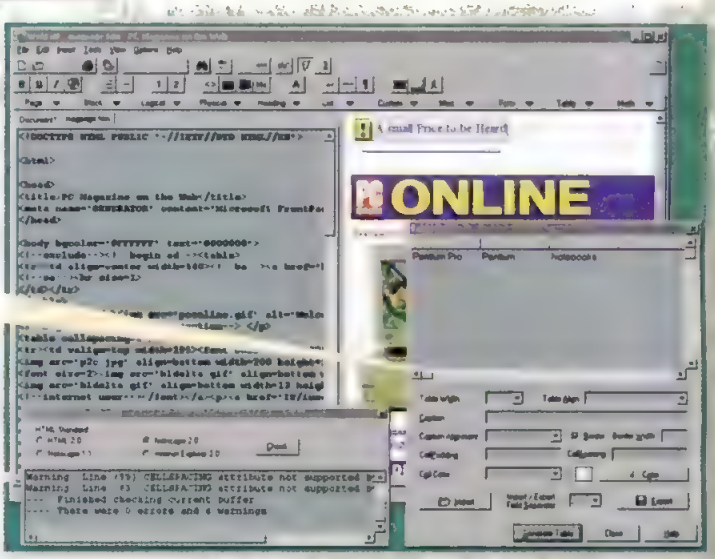
All the graphical tools let you see your HTML if you choose, and almost all let you edit it directly if you are familiar with HTML syntax. The goal of WYSIWYG editors is to ease page creation, but you can often achieve greater control by working directly with the code.

CODE-BASED TOOLS

With code-based tools, such as WebEdit Professional Edition 2.0, you see and work directly with HTML code. But page-creation is eased with toolbar buttons and other aids that let you insert tags rather than having to type them in. Viewing the page is a separate step, and may require that you load the page in your browser, although a preview module may be provided.

Sophisticated dialogs, property sheets, wizards, and other aids guide you in the creation of complex HTML objects such as forms or tables. Such tools also help you add elaborate multimedia elements to your page.

Many tools (both graphical and code-based) offer HTML validation procedures that can check your syntax, either on the fly or as a separate step. WebEdit lets you chose whether to check standard or browser-specific syntax.



selves have changed significantly, in terms of both their approaches and their capabilities. Last time they fell into two categories: standalone programs and word processor add-ons. This time only two of the products we reviewed, Quarterdeck WebAuthor and Blue Sky Software Corp.'s WEB Office, are add-ons. The rest are standalones; the trend is definitely away from the awkwardness of grafting one tool onto another.

GRAPHICAL OR CODE-BASED?

Our tools again fall into two broad categories, however. This time the distinction is between graphical editors and code-based editors. On the surface, the two types of applications look very much the same: Both resemble modern graphical word processors. The difference lies in the way each surfaces the elements that make up your page.

With graphical tools, you work with a more-or-less accurate WYSIWYG rendition of the page as it would appear in a browser window. The code is embedded in the page, but you don't see or work with it directly. Code-based tools, on the other hand, display raw HTML code as your basic view of the page but provide sophisticated code-generation facilities so you don't have to code by hand unless you want to do it.

Both types actually provide similar tools for creating and editing your pages. Toolbar buttons allow quick access to elements such as images, lists, and links, or to the tags that create or insert these elements, and they generally invoke dialog boxes that lead you through tasks. And many products offer wizards or assistants that automate at least basic page creation and prompt you through the construction of forms, image maps, and other complex undertakings.

Which type of tool is better is a matter of some debate. Unquestionably, WYSIWYG editors are easier to use, especially for novices, since they shield you from the arcane HTML syntax. As many of the tools we looked at prove, you can create an attractive page containing complex elements such as tables or frames without knowing HTML. All of the WYSIWYG tools we saw except Microsoft FrontPage and Netscape Navigator Gold also let you edit the HTML directly. The downside of graphical tools is that they provide only an approximation, often a poor one, of how your page will look in a browser. (All of the code-based editors also provide a preview function, but you're less likely to rely on it when you're working directly with code.)

Code-based editors arguably give you extra power and flexibility, and they certainly force you to be more aware of the code that's driving your document. The price of this power, of course, is that you must learn HTML. Thus, the trend is clearly away from tools that show you your code: As HTML grows more complex, it is ceasing to become a human-readable language, and the value of exposing it is diminishing.

But HTML is only a part of the story. If Web authoring tools are moving toward shielding users from technical details, most fall short in one important area: building interactive pages. Interactivity on the Web is still mostly based on forms that collect information from users and then, via a link to a CGI script on a server, process the information and return some result. Although many of the products we evaluated let you easily create sophisticated forms, most stop there, offering no tools for actually processing the forms. A notable exception is Microsoft FrontPage, whose built-in form handlers eliminate the need to write scripts to handle a variety of common tasks. Further, interactivity is moving to the client side, with executable content created through technologies such as Sun's Java or Microsoft's ActiveX controls, and few of the current crop of tools offer adequate support.

MANAGEMENT CHALLENGES

Moreover, a complete Web authoring environment requires a further set of features—for building, publishing, and maintaining a site. At the least, a product should provide a simple mechanism for uploading pages to a server. But the complexity of sites that may encompass hundreds of pages and thousands of links exceeds the human ability to grasp and track individual elements; thus, authors need tools for designing the structure of a site, for transferring that structure to a server, for easily updating selected pages or elements, and for assuring the continued viability of links.

Only a handful of the products we reviewed address these needs. Fewer still combine such features with up-to-date HTML and Microsoft/Netscape extension support and with easy page creation. Microsoft FrontPage and GNNpress come closest. Both provide excellent graphical views of a site under development, as well as tools for verifying and updating elements.

Using our reviews as a guidepost, you'll find a page creation tool to suit your coding style and your publishing needs, whatever your level of expertise. And one of the nicer sides of the Web is that you can download free trial copies of many of the tools reviewed in the following pages.

Microsoft FrontPage

Web authoring tools are still evolving, and no single product is likely to meet the needs of every author. Microsoft FrontPage makes an excellent attempt, though, offering a variety of features that will appeal to many users. Most important, it supports fast and easy HTML-page creation, though the fact that it makes the HTML code inaccessible will deter some users.

FrontPage is an innovative, multifaceted WYSIWYG tool that provides a complete authoring environment for creating, deploying, and managing sophisticated Web sites quickly and easily. It supports the latest Web standards and provides templates and wizards to get authors started. Creating interactive content is straightforward with FrontPage's WebBots—drop-in components that add functionality, such as threaded discussion, without complex CGI programming. A personal Web server lets you develop and test a Web site locally, copy the entire site to a server, and graphically view and update the site as needed.

Three other products deserve honorable mention. GNNpress seamlessly combines a Web browser with a full-featured WYSIWYG editor for unparalleled convenience, and it adds powerful built-in site management tools. Best of all, this robust tool is free.

HoTMetaL Pro boasts powerful features such as drag-and-drop insertion of graphics, a graphical frame editor, and support for the proposed HTML 3.2 tags. But it lacks strong site management tools, and it demands in-depth HTML knowledge despite its WYSIWYG interface.

For those who prefer to work directly with HTML code, WebEdit Professional Edition is an elegant, up-to-date package that includes support for frames, Java, and ActiveX. It also offers one-click FTP upload capability for posting your site.

Our Contributors: EDWARD MENDELSON and LUISA SIMONE are contributing editors of *PC Magazine*. THOMAS MACE is a senior editor of *PC Magazine*. AMARENDRA SINGH is a senior technical editor of PC Magazine Online. WAYNE KAWAMOTO is a frequent contributor to *PC Magazine*. DAVID LIDSKY, MICHAEL W. MUCHMORE, and TODD SPANGLER are staff editors of *PC Magazine*. EYAL RABINOVITCH is an editorial researcher at *PC Magazine*. SHARON TERDEMAN was the senior associate editor in charge of this story, and JAY MUNRO was the project leader.

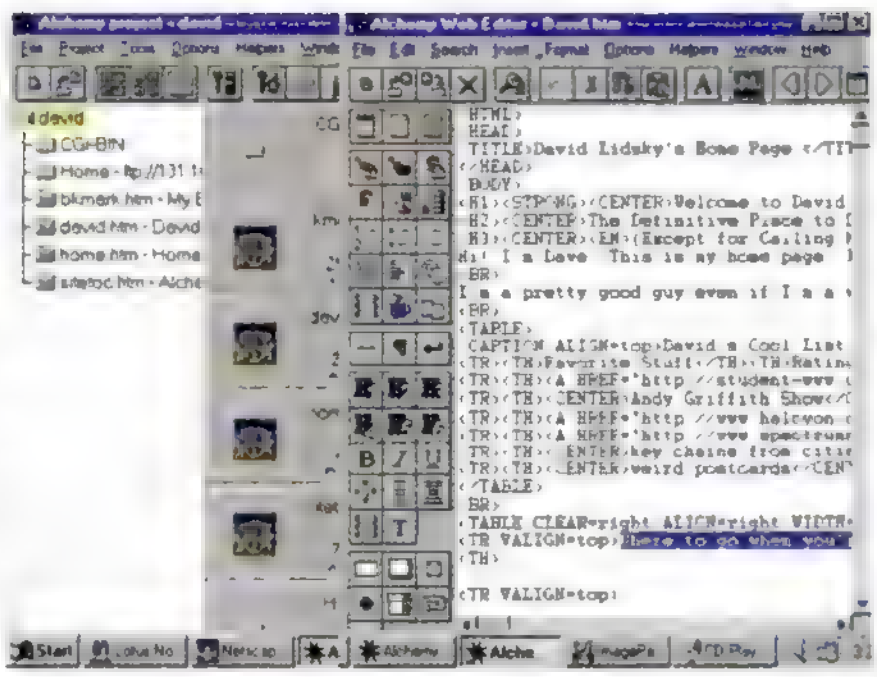
Next Wave Software

Alchemy 1.0

If you're not a Webmaster, turning lead into Internet gold with Alchemy 1.0 will probably be about as fruitless as the medieval science for which the product is named. But this $129 Web site manager from Next Wave Software, while not for neophytes, does let you upload, error-check, and update your Web page with just a single mouse click. This strong site management capability and easy integration with other authoring tools make Alchemy a valuable supplementary tool for users who already have favorite authoring software.

Getting started can be confusing. Before being able to save any work, you need to create a new project, entering items such as the ultimate URL, the server home directory, and the FTP host for the site. The help files explain how to rig your entries to do your work offline. Because it's aimed at Webmasters, Alchemy doesn't feature any tutorials, wizards, or templates to guide users through page creation.

Site management is Alchemy's great strength. Once files are inserted into a project, any changes you save in your editor will be automatically reflected in the project as soon as you return to the project window. When you upload your site, errors are checked and any problems are identified in Alchemy's message window. And Alchemy knows to upload only new information when you update your site. Alchemy also includes an FTP client so you can do it all yourself. Moreover, you can create a site map in addition to seeing all your site elements in the Project window.



Moving from Alchemy's Web Editor to its Project window updates your site and checks for errors.

Alchemy is powerful, but it's not for the faint of heart. Its editor is strictly code-based, and it can't import .DOC files. You need to understand HTML to use the editor, but for experienced programmers, Alchemy makes creating many attractive page features relatively easy. You insert HTML tags using one of the many toolbar buttons or pull-down menus, or the customizable Insert Tag list, which can help eliminate hand-coding.

Though Alchemy lacks separate editors for creating forms and tables and for inserting applets, it does open dialog boxes in which you can enter the necessary definitions for the tags. You can download pages, even entire sites, from the Web to edit and insert into your project. Alchemy recognizes all HTML 3.0 tags and Netscape extensions, but not Microsoft extensions. You preview your work in your own browser; Alchemy will accept most popular browsers except Microsoft's Internet Explorer.

Because Web-page creation is not Alchemy's raison d'être, the product lets you choose another HTML editor. You can also configure any other program—image, sound, or video editors, for example—as an Alchemy helper application for polishing page elements. Double-clicking a thumbnail representing a page element in your project window automatically launches the helper program.

In concert with other tools, Alchemy tables to external scripts to serve real-time data requests is a plus. We evaluate support for a variety of audio and video file formats, for inserting Java applets and Active X controls, and for scripting languages. An image-editing tool for creating transparent, interlaced, or animated .GIF or JPEG images enhances some products. Support for plug-ins is a bonus.

SUITABILITY TO TASK

Alchemy

	Power	Ease
Simple page creation	Good	Poor
Complex page creation	Good	Poor
Site management	Good	Fair

How to Read the Suitability to Task Boxes

Simple page creation We look for features such as tutorials, wizards, and templates that enable a quick start, and we assess the ease of formatting text, adding or modifying hyperlinks, and inserting graphics without hand coding. An easy way to insert a mailto link is a plus. The product should include a page-preview mechanism, either built-in or via an external browser. Also desirable are the abilities both to import HTML and word processor files and to grab links, pages, or even sites from the Web. HTML validation tools should point to syntax errors and suggest fixes but should not restrict opening a file. Any rules files should be editable. Additional pluses are color-coded syntax, tag-matching and search-and-replace capabilities, a spell-checker, and a thesaurus.

SUITABILITY TO TASK

Product name

	Power	Ease
Simple page creation	Poor	Poor
Complex page creation	Fair	Fair
Site management	N/A	N/A

N/A—Not applicable: The product does not have site management capabilities.

Complex page creation We consider support for the latest HTML specifications and Netscape/ Microsoft extensions, including forms, tables, frames, and client-side image maps. We give extra points if specialized editors or property dialogs ease their creation. Any imported rich text, spreadsheets, or word processor tables should retain their attributes. The ability to link

Site management A product should provide a simple FTP client for uploading pages to a server; HTTP Put is a plus. Even better is the ability to stage an entire site locally and move it to the server. Products should verify local and remote links, compare a developing local site with its remote counterpart, and upload only changed elements. A product that can generate a graphical site map and a link status report provides useful extras.

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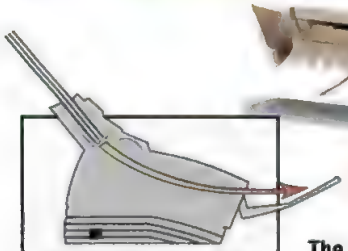

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HTML 3.2: Achieving Higher Standards

By Amarendra Singh

When Tim Berners-Lee developed a simple hypertext mechanism to link text documents, he couldn't foresee that this modest development would explode into the World Wide Web. HTML's transformation from a language for simple text pages to one that supports today's sites—which use color, video, sound, fancy background bitmaps, and even embedded applications—has been astounding.

The Internet Engineering Task Force and the World Wide Web Consortium have the task of describing and developing HTML in compliance with its SGML roots, while incorporating additional media types using standards such as MIME. HTML has been in use since 1990, at first existing as a set of informally documented capabilities that mainly addressed control of character formatting, headings, lists, links, and image elements. The language continued to evolve, eventually coalescing into Version 2.0 (so called to distinguish it from the earlier informal versions). HTML 2.0 clarified and formalized HTML features and added commands for menus and interactive forms.

The draft specification for HTML 3.0, issued in March 1995, included support for such features as tables, background images, and mathematical equations. The differences between HTML 2.0 and 3.0 were so large, however, that the entire proposal's standardization and deployment proved unmanageable. The draft expired and is no longer being maintained.

The current proposed version of HTML specifications, 3.2, adds support for tables, applets, text flow around images, and superscripts and subscripts. The table tag now allows control over the display of table elements before the entire table has been loaded, and it extends control over table contents, including background color and internal cell alignment. The proposal adds frames to the spec, including variations such as borderless frames. All new 3.2 tags are backward-compatible with any browser that supports tables, and they all use naming conventions that don't conflict with SGML specifications. The abiding principle of HTML 3.2 is to give Web authors greater control over layout through design elements such as tables and frames.

MOST SIGNIFICANT: STYLESHEETS

Of the proposed additions to HTML in 3.2, cascading style sheets (CSS1) are perhaps the most significant. Style sheets let Web designers separate a page's layout and visual structure from its content, enabling more browsers to view at least the basic contents of a page. The specification consists of a generalized STYLE tag that lets you integrate supplementary styles without having to add the specific tags to HTML itself.

You can create and store a single style sheet definition for various documents by simply having the documents refer to the style sheet. This makes it much easier to create a consistent look. But while you may design style sheets for specific display configurations, no mechanism now exists for the browser or other client to adapt the presentation to the browser configuration. CSS1 recommends allowing clients either to disable the default style sheet or to select a personal style suitable for their machine.

Recent innovation in page display has come through Netscape's plug-in architecture and through using Java as a visual element; Microsoft's ActiveX may add to it as well. None of these are true HTML extensions, however. In order to incorporate these advances, HTML 3.2 includes a simple compound document architecture based on a new EMBED element. This specification does not define an API to compete against Netscape and Microsoft standards, but it does enforce architectural standards to make EMBED a container. EMBED also addresses Sun's Java APPLET element by incorporating it into the EMBED tag.

If HTML is to compete against rich document formats (see "Alternative Publishing Formats," also in this story), it needs to evolve incrementally with further open extensions of its standard. HTML 3.2 attempts to level the field in the browser wars, but Netscape and Microsoft will have to accept both the spirit of the new specs and the tags if HTML 3.2 is to serve its purpose.

can be a valuable Web project creator (particularly for experienced site developers), because of its solid site management and integration abilities. The product is not meant for simple page creation, however, so first-time Web authors should look elsewhere for a more user-friendly product.—*David Lidsky*

Alchemy 1.0. Direct price: $129. Next Wave Software, Rochester, NY; 716-546-1386; fax, 716-546-2468; www.stormsurge.com. *Circle 441 on reader service card.*

Macromedia Inc.

Backstage Designer Plus

Macromedia's Backstage Designer Plus provides Webmasters with tools for creating and publishing graphically rich, multimedia-enhanced Web pages. Designer Plus ($99) allows you to incorporate multimedia with Macromedia's PowerApplet presentations and customizable Director and Java applications. It also includes Backstage Manager, a strong site management tool. But Designer Plus lacks support for tables and frames, and all those powerful tools are not easily accessed. These deficiencies keep it from being an all-in-one solution.

The WYSIWYG authoring interface is very similar to that of CorelWeb.Designer. Originally licensed from iband, both interfaces offer an instant, graphically accurate preview of your page. The editor looks and feels like a word processor but

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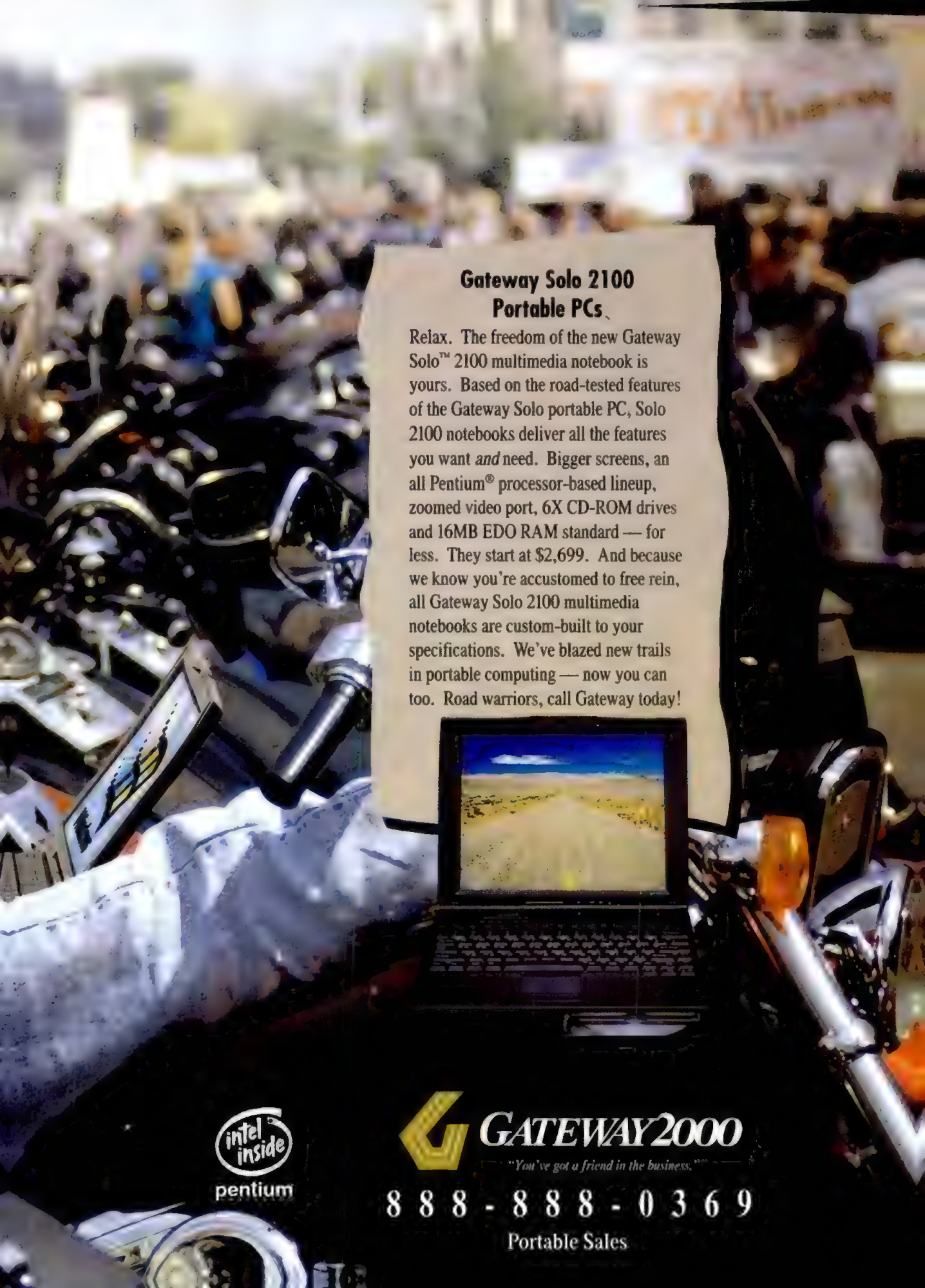
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adds buttons to create hyperlinks, forms, and font colors. You select wallpaper or background colors and the color of the text and hyperlinks through the Page Properties menu option. The image-map editor and multimedia support can be accessed directly from the toolbar, meaning you can insert Java applets, Microsoft ActiveX controls, and Netscape plug-in programs from within the editing window.

The powerful multimedia authoring tools, which let you create animated graphics and slide-show presentations, are what separate Designer Plus from most other WYSIWYG editors. These applications include the xRes 2.0 Special Edition graphics editor, as well as the Macromedia PowerApplets for creating Shockwave and Java presentations. But in order to launch the PowerApplets, you must search for the programs in the directory hierarchy, and the graphics editor must be separately installed. The PowerApplets' animated presentations offer creative ways to spice up your Web pages, but using them is difficult without the help files, which are hidden as .HTM documents in each application's home directory.

There's a slew of categorized clip-art images, but conspicuously absent is a clip-art guidebook or preview feature. You must either open each .GIF file with the graphics editor or insert the image into your page to see it. Also, you can't access the art directly from the program CD-ROM; you must install the 25MB file onto your hard disk.

Backstage Manager, the site management tool, offers excellent site management and uploading capabilities. Not only can you upload your files to a specified remote site, you can also retrieve remote files from any server to which you have password access. After you have created and saved your pages locally, Manager gives you an outline view of your project directories, letting you restructure them via cut-and-paste. You can work on local and remote projects at the same time and thus can add to your remote site only the files you have updated.

The Macromedia PowerApplets provide Backstage Designer Plus with Web-page animation capabilities.

Macromedia offers two high-end Web authoring packages that provide more comprehensive server-side control: Backstage Desktop Studio and Backstage Enterprise Studio. Backstage Server lets you develop dynamic sites with discussion areas and complex database connectivity.

You can design, publish, and maintain Web pages full of color and animation quickly and easily. Once you find the programs, images, or documentation you need, the package comes through with high-quality pages organized into well-constructed, easy-to-manage projects.—*Eyal Rabinovitch*

Backstage Designer Plus. List price: $99. Macromedia Inc., San Francisco, CA; 800-288-4797, 415-252-2000; fax, 415-626-0554; www.macromedia.com. *Circle 442 on reader service card.*

SUITABILITY TO TASK

Backstage Designer Plus

	Power	Ease
Simple page creation	Good	Good
Complex page creation	Good	Fair
Site management	Good	Excellent

Corel Corp.

CorelWeb.Designer

If you simply want to create colorful Web pages full of predesigned images and graphics, the three programs that make up Corel Corp.'s $149 CorelWeb.Designer product—Web.Designer, Web.Gallery, and Web.Transit—can do it for you quickly and easily. But there's a tradeoff: The package lacks support for more sophisticated page elements like tables, frames, and multimedia extensions.

Web.Designer's WYSIWYG editing environment, with a toolbar that includes buttons for inserting background images, forms, and graphics, is almost identical to the one found in Macromedia's Backstage product line. Both Corel and Macromedia licensed it from iband inc. before Macromedia acquired iband earlier this year. Web.Designer, however, doesn't support inserting Netscape plug-ins, Microsoft ActiveX controls, or Java applets, as does Macromedia Backstage Designer Plus (also reviewed in this roundup). But the word processor–like interface makes page creation and editing almost intuitive, and the excellent WYSIWYG display lets you instantly preview your page. Unfortunately, the program lacks an integrated browser, and you can't import pages from the Web or test your links.

If you're unsure of how to begin, Corel includes more than 100 predesigned templates in Web.Gallery, an assortment of more than 8,000 categorized templates, backgrounds, images, and photos. They are fully previewed in both the Web.Designer manual and the Visual Multimedia File Manager. The Multimedia File Manager lets you browse through the catalog of images and drag and drop them into your Web page. Because of space considerations, the clip art isn't installed on your hard disk, so the Web.Designer CD-ROM must be in the drive for clip-art access. This mammoth collection, which can be bought separately for $99, would be a useful accompaniment to other HTML editors as well.

The final member of the Web.Designer triumvirate, Web.Transit, is a file conversion utility that lets you convert almost any word processing file into an HTML page. Not only will Web.Transit maintain your word processor's formatting for text and tables, it will also give you the option of creating a table of contents for long files. The table of contents creates links that allow a reader to jump to predetermined points in the file. Unlike Web.Designer, Web.Transit does allow you to launch your browser from within the pro-

SUITABILITY TO TASK

CorelWeb.Designer

	Power	Ease
Simple page creation	Excellent	Excellent
Complex page creation	Poor	Good
Site management	N/A	N/A

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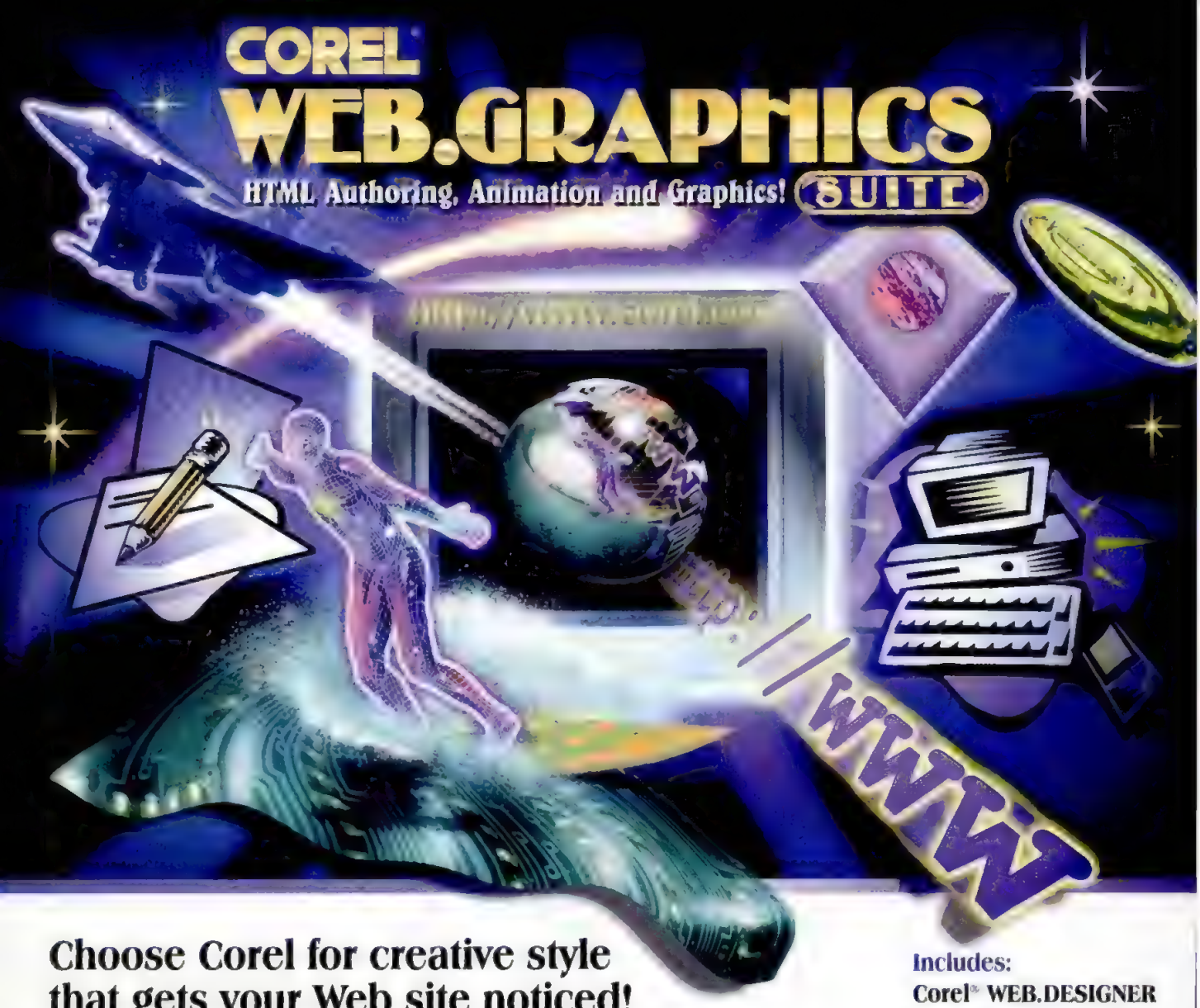

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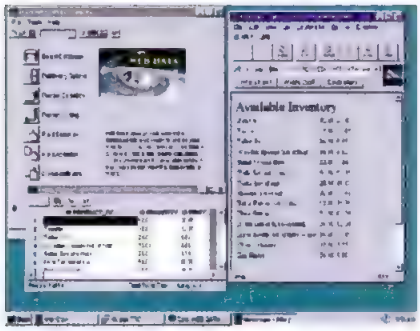
Don't Know HTML? These Might Convert You

By Wayne Kawamoto

If you're more interested in creating Web pages than in learning and using HTML, quite a few utilities can help you translate files from popular applications into HTML files ready for use on the Web.

MAKING THE TRANSITION

Corel Corp.'s CorelWeb.Data, list price $119 (*www.corel.com*), specializes in transforming databases into HTML documents and lets you access Oracle, Access, FoxPro, Lotus 1-2-3, Paradox, and dBASE data. Web.Data also offers

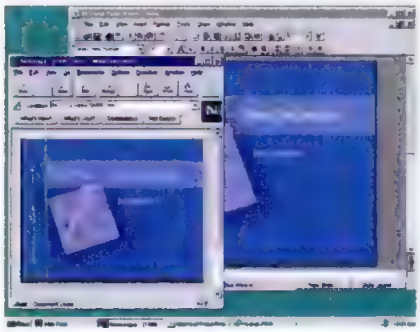


CorelWeb.Data uses a convenient "recipe" approach to converting databases into HTML.

an easy recipe for building templates. It lets you choose the records and fields that you want to export, sorts the data, and sets field layouts.

SkiSoft's excellent Web Publisher (*www.skisoft.com*), $495 for the Standard edition and $990 for the Pro single user version, converts .RTF files into HTML and also translates Excel and PowerPoint documents. It lets you define templates and use them for later documents to give your HTML pages a consistent look and feel. The program can also conveniently batch process files, create buttons that jump between pages, automatically build links from existing indexes, and convert embedded graphics into .GIF format.

FTP Software's KEYview (*www.ftp.com*), a combination viewer and translator with a $49.99 list price, opens and views a variety of word



Internet Assistant for Microsoft PowerPoint 95 reproduces your presentation in a browser just as it appears in the program.

processor, spreadsheet, raster, and vector format files, as well as HTML files. It comes with KEYview Conversion Tool, a standalone utility that easily converts between formats, including HTML, and that works with Windows' Explorer or File Manager to drag and drop files for conversion.

HTML Transit from InfoAccess (*www.infoaccess.com*), $495 list, offers a template approach to adding HTML tags to ASCII or word processor text, building pages with consistent styles and headers. To use HTML Transit, select a source text file and assign translator elements—settings that determine a document's behavior or appearance (such as those affecting graphics and headings).

WORK WITH WHAT YOU HAVE

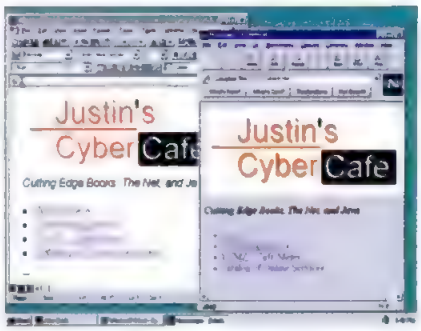
Without digging into your wallet, you can use one of Microsoft's free Internet Assistants to convert Word, Excel, and PowerPoint documents into HTML. Internet Assistant for Microsoft Word for Windows 95 (*microsoft.com/msword/internet/ia/ia95/default.htm*) translates Word documents into HTML; supports extensions such as tables, font size, and centering; and creates hyperlinks. This add-on, which presents new tools within Word, offers substantial HTML authoring capability and can act as a viewer, but it's strongest as a conversion tool.

For publishing spreadsheets online, Internet Assistant for Microsoft Excel (*198.105.232.6:80/msexcel/Internet/ia/default.htm*) offers an add-on Wizard that walks you through the process of selecting cells and then exporting them as separate files or into tables of existing templates.

Internet Assistant for Microsoft PowerPoint 95 (*www.microsoft.com/mspowerpoint/Internet/ia/default.htm*) adds an "Export as HTML" command to the PowerPoint File menu. Using this, you can generate HTML versions of a presentation, and the resulting documents feature the same links as the presentation for jumping from slide to slide.

Strictly a one-trick tool, Net-Scene's PointPlus Maker (*www.netscene.com*), list price $199, saves PowerPoint presentations into a compact file format ideal for Web servers. To view these, you'll need PointPlus Plug-in for Netscape Navigator.

For WordPerfect users, the WordPerfect Internet Publisher add-on, at press time still at Novell's site (*wp.novell.com/elecpub/export.htm*), lets



Internet Assistant for Microsoft Word includes an editor and browser, but it works best as a convertor.

you edit documents in a WordPerfect window that contains a special HTML toolbar. You can format text using WordPerfect's character and paragraph styles and can then export files into HTML. This free add-on uses WordPerfect's bookmark feature to build links, which works fairly well, but the tool's graphics support is only fair, with no support for .GIF images.

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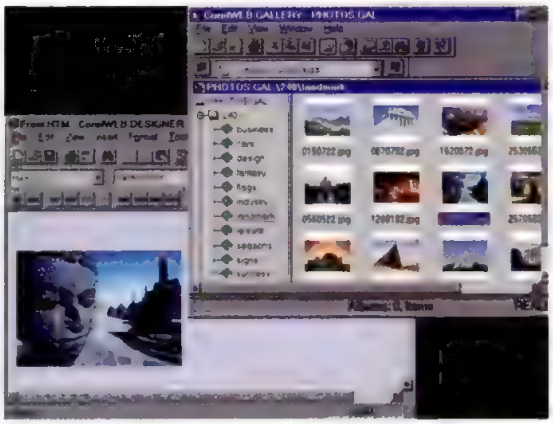
gram to view the converted document. And you can also launch Web.Designer to edit or format the document further. Unlike Web.Gallery, Web.Transit is not sold separately.

To compensate for Web.Designer's lack of multimedia support, Corel plans to include the program in its Web.Graphics suite, expected to be released by the time you read this review. The suite will include a Java animation tool, a full vector graphics editor, and a VRML authoring tool.



CorelWeb.Gallery lets you browse online clip art and insert the images via cut-and-paste.

CorelWeb.Designer is solely an authoring tool; it offers no support for direct uploads or site management. Nonetheless, its capable file conversion tool and extensive clip-art collection, along with the direct yet powerful WYSIWYG editing interface, make the product an excellent choice for simple Web-page creation.—*ER*

CorelWeb.Designer. List price: $149. Corel Corp., Ottawa, Ontario, Canada; 800-772-6735, 613-728-3733; fax, 613-728-9790; www.corel.com. *Circle 443 on reader service card.*

DeltaPoint Inc.

DeltaPoint QuickSite 1.02

DeltaPoint QuickSite 1.02 ($99.95) is both a Web-page creation tool and a site management program designed for novices who want to do it all themselves. You can create a well-organized Web site and simple HTML pages, but the program's unintuitive interface and quirks can confuse a beginner. Also, QuickSite's lack of an error-checking feature hampers its value as a site manager. QuickSite Professional ($295) is expected around the time you read this and will add features missing in this version.

QuickSite stores Web-site information in a .DBF database file. When you build your site, the program generates all the HTML pages and links between pages based on your formatting. As a self-contained database, QuickSite projects can reuse pages, images, and other elements you've defined. If you redefine or rename the original element, all other references are updated when you rebuild the site.

Creating a new project in QuickSite starts a wizard, in which you enter information for the entire site (such as its title and its initial layout). You can also set elements to be shown on every page, including graphics or an e-mail address. QuickSite's main view then displays your site's pages and elements. Clicking on a page in the main window brings up an editing screen.

QuickSite gives individual page creation another head start by including useful graphics, text, forms, and URLs in its library. You can add or delete items in the library, which is stored as a .DBF file.

The HTML editing interface is an unsophisticated text window, and the HTML tag list is accessed by clicking on one of the few toolbar buttons. QuickSite includes a helpful online HTML guide, but you will still need to be both familiar with HTML tag names and comfortable creating your page in a code-based editor. Many tags, like the hyperlink tag HREF, are just inserted into your page without a dialog box prompting you for the proper information to make the tag work. The program doesn't support multimedia elements like applets or video files, but they can be added if you know how to code them into your pages. QuickSite includes a simple table editor, but it can't import tabular data from Excel or Word. It limits tables to seven columns, and you must link a table to an existing text page instead of incorporating it in a page. You can manually build a table in a page, however. The product doesn't include a frame editor or any server-side support.

SUITABILITY TO TASK

DeltaPoint QuickSite

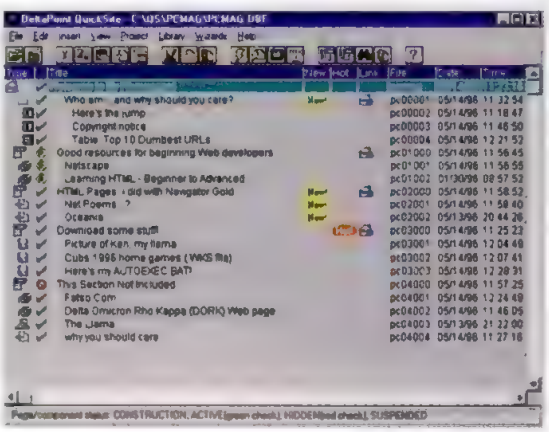
	Power	Ease
Simple page creation	Fair	Good
Complex page creation	Poor	Fair
Site management	Good	Good

If you already have some HTML pages created, QuickSite will let you add them to your project. You can either import an HTML file as text directly into an existing QuickSite page or simply insert the file as a separate page in your site.

Uploading your project is easy; just one click of the Publish button and your site is on the Web. You can preview your work in a browser before you upload—the only way to check for broken HTML tags or illegitimate URLs, since QuickSite lacks HTML- or URL-validation features. Although QuickSite shows a hierarchical outline of your pages, you can't see all the logical links between pages or to external URLs.

Ultimately, QuickSite offers the basic tools to create a straightforward Web site of simple pages, but its lack of error-checking hurts its site management utility.—*Todd Spangler*

DeltaPoint QuickSite 1.02. List price: $99.95. DeltaPoint Inc., Monterey, CA; 800-446-6955, 408-648-4000; fax, 408-648-4020; www.deltapoint.com. *Circle 444 on reader service card.*



QuickSite's main view displays all your site elements, letting you define basic properties.

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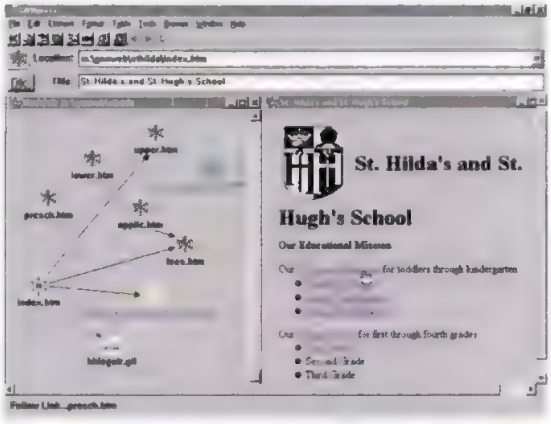
GNN Hosting Service

GNNpress

America Online's GNN Hosting Service gives away GNNpress to anyone who wants to download it, but this 16-bit WYSIWYG editor, with a powerful built-in site manager, offers more flexibility and ease of use than most products you have to pay for. The beta copy of Version 1.2 easily creates tables, forms, and client-side image maps, but not frames. It also supports Java applets and many features of the proposed HTML 3.2 standard, including tags for strikeout. Because its editing window also acts as a Web browser, you'll have to get used to some interface quirks. Nevertheless, this is one of the most impressive HTML editors available, and no one can beat the price.



GNNpress's MiniWeb window displays a Web site's design with color-coded links and icons.

To use GNNpress, simply download a 2MB file and let it install about 4MB on your disk. The interface includes a toolbar, a box that names the location of the current file, and a box with the title of the HTML file, which you can edit. You create text, headers, and tables in the editing window as you would in a word processor, using shortcut keys or the top-line menu to apply formatting tags.

To create a table, enter text in the cells displayed on the page; the menu gives you the options of combining cells, inserting or removing rows and columns, and transforming an ordinary cell into a header cell. Forms are created using a toolbar that brings up dialog boxes of different input tags for features like checkboxes and text fields. You don't have to know the HTML code required to group radio buttons so that only one can be turned on at a time, because the dialog box intelligently fills in the codes for you. If you inadvertently make a change that creates invalid HTML code, the program corrects it for you.

Unlike some WYSIWYG editors, GNNpress doesn't restrict you from editing HTML code. A menu option opens the current file in a text-editing window, where you can edit the full source code. HTML tags are displayed in color for convenience. A menu option lets you check your codes for syntax errors while you work, and when you close the window, the program offers to apply your changes to the WYSIWYG view.

GNNpress is impressive in its range and power as an editor but works best when you use it to create a whole Web site. It organizes pages into "MiniWebs," which it displays in the form of diagrams in which each page, link, and graphics file is indicated by icons and color coding. To create a new page, you create a link to it in a page you're editing. When you click on the link in order to jump to the new page, a dialog box tells you the page doesn't exist and offers to create it for you. Each new page is added automatically to the current MiniWeb. You can create a MiniWeb from existing pages by copying them into a directory and telling the program to "Webize" them. When the MiniWeb diagram is in the current window and you give the Save command, all the files in the MiniWeb are saved to disk. GNNpress won't save your MiniWeb to a remote computer, but the companion GNNserver program (also free) includes full site management features.

The weakest part of GNNpress is its interface, which tends to get cluttered with more windows than you can keep track of. The control bar of a window you're working on often disappears under the toolbar, where it's inaccessible to the mouse, and you can get it back only by tiling or cascading all open windows. But this is a minor annoyance in a full-featured program that offers an effective alternative for anyone who wants to edit in both WYSIWYG and source-code modes—and for anyone who wants to get a powerful HTML editor absolutely free.—*EM*

GNNpress. List price: Free. GNN Hosting Service, Santa Barbara, CA; 800-819-6112; fax, 703-448-0760; www.tools.gnn.com. *Circle 445 on reader service card.*

SUITABILITY TO TASK

GNNpress

	Power	Ease
Simple page creation	Excellent	Excellent
Complex page creation	Good	Good
Site management	Good	Excellent

Anawave Software

HotDog32

Despite its many rough egdes, Anawave Software's HotDog32 deserves its wide popularity among amateur and professional HTML authors. The new 32-bit version of the non-WYSIWYG editor ($99.95) offers quick entry of up-to-date HTML tags for graphics, links, lists, tables, and scrolling marquees, but it won't create frames. It gathers HTML files for your Web site into "projects," search-and-replaces text in multiple files, and has built-in FTP for uploading files to a remote site. With all its conveniences, HotDog32 remains a product for experts who don't mind working with raw HTML code and can live with a funky interface and disorganized help files.

HotDog32, developed by Sausage Software (*http://www.sausage.com*), was available only via download from the Internet at press time. Two self-extracting files install the product, but you may have to complete the installation by restarting in DOS mode and extracting and copying some files by hand. Compared with a still-available 16-bit version called HotDog Pro, the 32-bit version starts more slowly and wastes time and screen space on an animated splash screen and bone-shaped toolbar. You can switch off this "Bonebar," but you can't customize it. Other floating toolbars can be customized to insert text or perform any program command. Also, program functions can be as-

SUITABILITY TO TASK

HotDog32

	Power	Ease
Simple page creation	Excellent	Good
Complex page creation	Good	Fair
Site management	Good	Good

Alternative Publishing Formats

By Luisa Simone

Competing with the HTML format isn't easy. After all, HTML was designed specifically to facilitate the speedy transmission of documents. To keep files small, all text in HTML files is maintained as plain ASCII; and it is the end user's browser application, not the HTML document, that supplies font and formatting instructions. Moreover, progressive downloads let the user read text while images are transmitted.

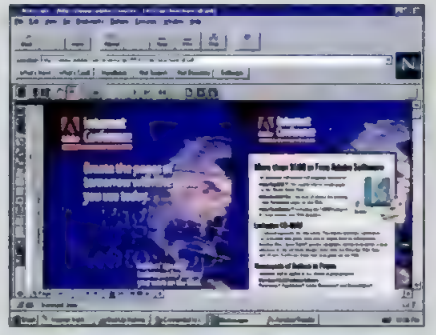
Divorcing content from design has worked remarkably well for HTML. Even low-level computer systems using slow analog telephone lines can access the Web efficiently. But the same features that make HTML effective also result in its chief limitations: The author can't control a document's appearance, and thus the reader can't receive information in an optimal format.

One remedy has been to make the HTML format more robust. HTML 3.2 supports tables, style sheets, and frames to vary page design, and Adobe, Apple, and Netscape have announced plans for HTML versions to support Type 1 and TrueType fonts.

An alternative is to use portable electronic documents created with Adobe Acrobat (Adobe Acrobat 3.0, $295, Adobe Systems Inc., 800-833-6687, *www.adobe.com*), Common Ground (Common Ground Web Publishing System, $999, Hummingbird Communications Inc., 800-598-3821, *www.commonground.com*), or Tumbleweed's Envoy (Tumbleweed Publishing Essentials, $695, Tumbleweed Software Corp., 415-363-7022, *www.tumbleweed.com*). These products have been on the market for several years, but each has been optimized for the Internet in new and noteworthy ways.

THE SAME BUT DIFFERENT

Portable electronic documents and HTML documents are both platform-independent, and users can view them on-screen using reader applications. But unlike HTML, portable documents require proprietary viewer programs for accessing files (which means different readers for Acrobat .PDF files, Common Ground's Digital Paper format, and Envoy files). Most important: Portable documents preserve the author's type design and layout.



Complex layouts that overlap text and graphics and the ability to mix and match typefaces distinguish the portable document format from HTML.

Designers know that choosing a font is crucial to a publication's look and feel. Acrobat, Common Ground, and Envoy make special efforts to replicate letter shapes and line breaks faithfully, even for readers whose systems don't have the appropriate fonts. All of the programs support both font embedding and font substitution, the latter resulting in smaller documents for quicker downloading. Portable documents can also include other design elements that are still beyond the scope of HTML, such as multiple columns, text wrapped around graphics, vector images, large initial caps, and multiple typefaces.

AESTHETIC BUT PRACTICAL

Although these issues may seem purely aesthetic, they have practical ramifications. Portable documents maintain the page format of conventional publications, so printed versions look like good old-fashioned pages. This is preferable to the format of printed HTML documents, which often consist of unstructured streams of data.

This link to traditional design is also a big plus when creating or converting documents. Though HTML authoring tools are becoming WYSIWYG editors that look and feel like desktop publishing programs, generating HTML documents still requires you to learn yet another application program.

By contrast, Acrobat Exchange (part of Acrobat 3.0), Common Ground ($189), and Tumbleweed (Envoy) Viewer Extensions ($79) install a virtual printer within the Windows environment. Creating a portable document is as easy as printing from your word processing, desktop publishing, or spreadsheet program.

Companies with large libraries of legacy documents are finding HTML conversion to be a huge undertaking, requiring the reworking of page layouts for HTML's limited capabilities. But the portable document format has no such limitations and can be a direct conduit from conventional to online publication.

Furthermore, products such as Acrobat Distiller (part of Acrobat 3.0), Common Ground AutoMaker ($2,500), and Tumbleweed Publisher ($199) streamline the conversion with batch processing modes and automated routines. When anyone on a network moves files to a specified directory, these products automatically convert them to a portable document format by means of translation filters (as with PostScript files) or via DDE links that invoke the source application in the background to use the virtual printer driver.

To compete with HTML, portable electronic documents must match HTML's accessibility, transmission speeds, and search functions. Netscape Navigator 2.0's Plug-In architecture and Microsoft's Open X technology have given users seamless access to portable documents from within the browser window.

Portable document programs are also adopting common HTML document techniques, such as progressive downloads. You'll also be hearing a lot about page-on-demand, or byte serving, because it addresses the biggest performance bottleneck associated with portable documents. Whenever you access a portable document, you must download the entire document before viewing it. Page-on-demand lets you download specified pages, so you can get the information you want in less time.

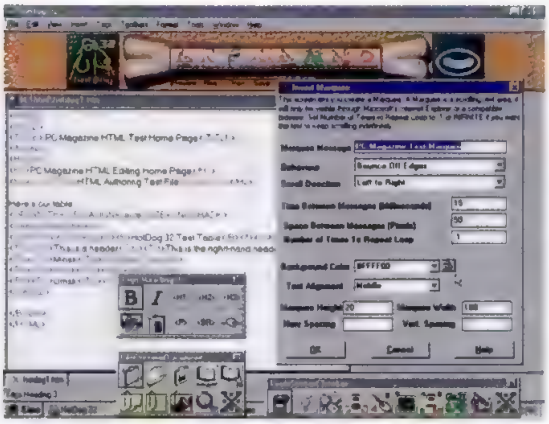
Common Ground and Envoy are shipping versions that support page-on-demand, and Acrobat 3.0, which should be available by the time you read this, will include Adobe's byte serving technology. You should note that you won't reap any of the benefits of byte serving unless the server software supports it.

Indexing and search engines are the last pieces of the puzzle. Acrobat Catalog, Common Ground Web Publishing System, and Tumbleweed's (Envoy) Index Builder can build indexes that help readers find specific documents in large collections. But you can search those indexes only if you've upgraded from the free readers to Acrobat Exchange (included in Acrobat 3.0), Common Ground ProViewer, or Tumbleweed Viewer Extensions.

GREATER SYNERGY AHEAD

Ultimately, the producers of portable document programs aren't trying to replace HTML; rather, they intend to create a synergy between the two formats. The proof is that all three products make it easier to move between portable documents and HTML pages by supporting more robust hypertext links.

If the technology works as advertised, everyone will benefit. Authors will be able to choose whichever format best suits their applications and their content, and readers will be able to move seamlessly between HTML and portable electronic documents.



Turning off the "Bonebar" in HotDog32 creates space for intelligent dialog boxes.

signed to custom hotkeys, and new HTML tags can be added to the menus.

HotDog32 starts by creating the bare skeleton of an HTML file with the required header and body codes already entered and the cursor in position for you to add graphics and text. You can convert any HTML file into a template that can be used as the basis of new HTML files. To add images or links, you enter data in dialog boxes. But to modify a link or tag after you've created it, you generally must hand-edit the code. In the table-creation dialog box, some cells accept multiple words; others accept only one word of input and then push the cursor to the next cell (but when you return to the main editing screen you can enter the multiple words the dialog box wouldn't accept).

You can import text files or drag them directly into the editing window from the program's internal file manager. If you drag a graphic from that file manager, you create a link, but don't try dragging the same graphic from Windows Explorer, because it will fill your document with garbage characters. An HTML syntax-checker warns of codes and tags that are ignored by older browsers, but it won't catch misplaced angle brackets or other minor errors. You can preview files in one or more browsers or open a built-in previewer that acts like a generic Web browser but adds a set of radio buttons for adjusting the display to match various default screen sizes. Changes you make in the editing window appear a few seconds later in the preview window, but the previewer jumps to the top of the file when it updates. And, because cursor keys don't work in the previewer, you have to fuss with a scroll bar to see the foot of the file.

Unfortunately, many new features seem designed to make a serious tool look and sound like a game. The new "Bonebar" is merely silly, as is a mixing console that lets you attach recorded dog barks to any program function.

HotDog32 remains one of the best code-based HTML editors, but if you're not already committed to it, you may want to look at programs with smoother, more modern interfaces.—*EM*

HotDog32. List price: $99.95. Anawave Software, Newport Beach, CA; 800-711-6030, 714-250-7262; fax, 714-250-7265; www.anawave.com. *Circle 446 on reader service card.*

SoftQuad Inc.

HoTMetaL Pro 3.0

Anyone seeking an industrial-strength HTML editor need look no further than HoTMetaL Pro 3.0. SoftQuad's $159, 32-bit WYSIWYG editor has more power and features than Version 2.0, an Editors' Choice in our issue of October 10, 1995. But despite enhanced ease of use, users still must possess considerable HTML expertise. Anyone needing the power provided by this package may also want the site management features that the program lacks. SoftQuad does promise a separate site management program due out later this year.

Don't expect hand-holding features like form-building wizards from HoTMetaL. But do look for drag-and-drop graphics insertion, an image-map editor that creates irregular shapes, undo capabilities back to the last time you saved the file, recordable macros, conversions from major word processing formats, and support for the latest proposed HTML 3.2 standard.

The program includes dozens of templates and graphics, as well as extensive tutorials and help. The somewhat over-

SUITABILITY TO TASK

HoTMetaL Pro

	Power	Ease
Simple page creation	Excellent	Excellent
Complex page creation	Excellent	Good
Site management	N/A	N/A

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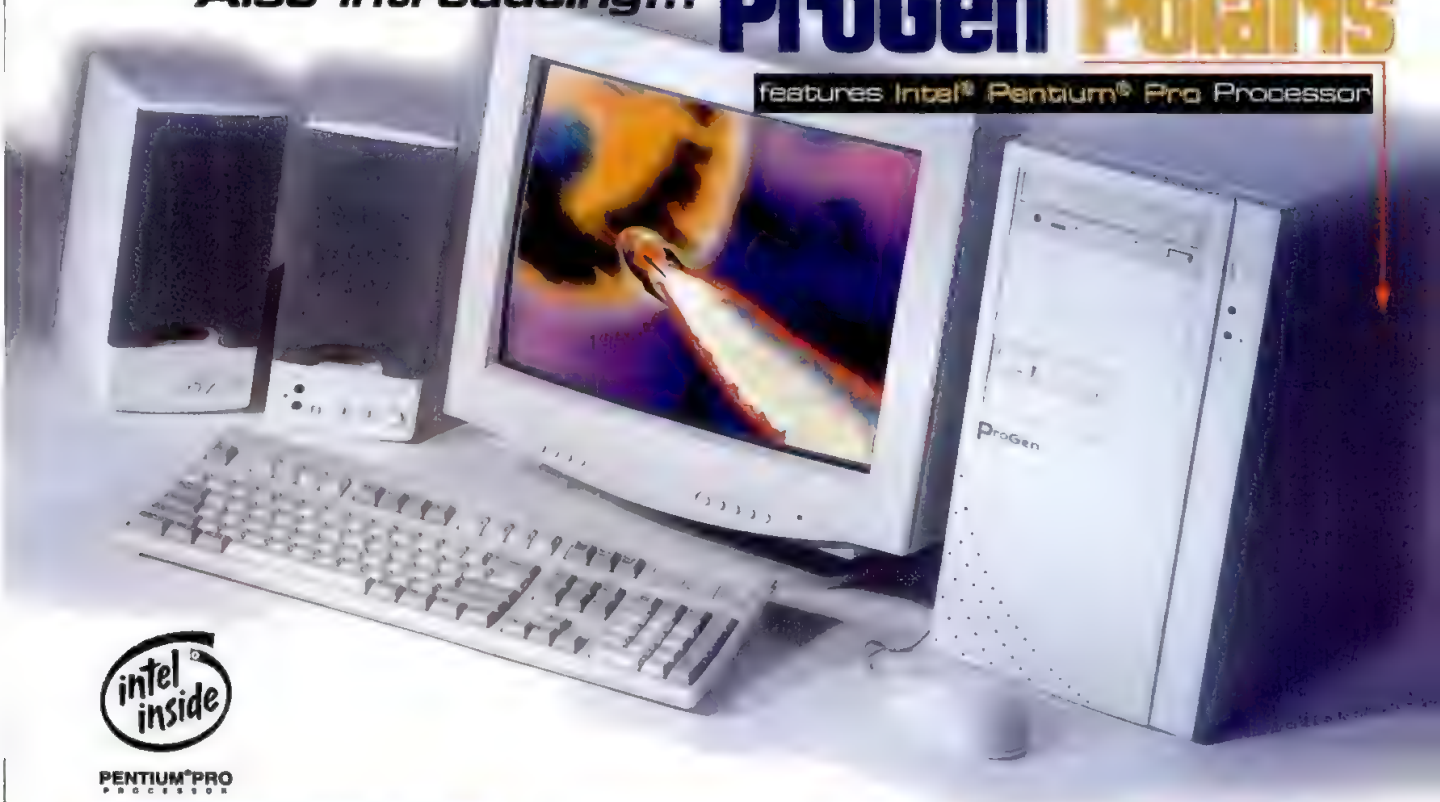

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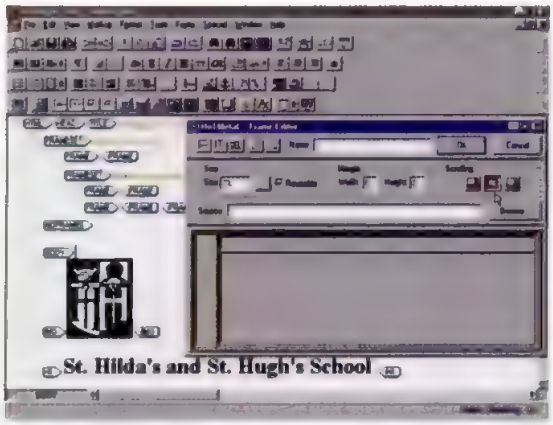


HoTMetaL Pro's frame editor builds frames interactively as you resize them with the mouse.

whelming interface has four toolbars: one for system functions; one for character attributes; one for lists, anchors, and graphics; and an advanced features bar for forms, Java applets, and ActiveX. The editing window normally shows your work in near-WYSIWYG form, with HTML code displayed as small icons. You can hide the tag icons and other distracting features to work in a pure WYSIWYG environment.

You create lists, links, and headings by selecting a toolbar icon and typing. Images and links can be dragged from Explorer or from the desktop directly into the editing window. You can't drag from a browser, although you can drag the address of the file displayed in Netscape Navigator 3.0 by dragging the link icon in Navigator. When you create links or insert images using dialog boxes available from the top-line menu or toolbar, the program provides fields for you to insert the most essential data. To use the most advanced HTML options, you right-click on an element in the editor to bring up a formidable dialog box that displays all possible options. Oddly, these advanced dialog boxes lack the browse buttons of the simpler dialog boxes that let you hunt for filenames.

HoTMetaL's superb table editor lets you add or remove rows and columns, combine multiple cells into one, and generally manage tables with great aplomb. The less capable form-creation tools let you add elements in WYSIWYG view directly into your file, but the interface assumes that you understand HTML form structure. The image management module builds thumbnail catalogs of graphics on your disk, and the image-map tool creates client-side or server-side maps. The frames editor lets you draw the skeleton of a frame document and drag the file that will display the frame from Explorer, but it won't display the content in the frames.

True to its SGML heritage, HoTMetaL checks the syntax of imported HTML files. Sometimes, though, the program reports errors that don't exist. When the program detects errors upon opening a file, it displays the file as raw HTML text, with the cursor on the offending code. You can usually view the file in the normal editing window despite the reported errors, although you may have to remove some seriously defective tags by hand.

If you're building a complex Web site, you may prefer the site management features of more recent packages like Microsoft FrontPage. But if you're looking for the maximum power available in an HTML editor, HoTMetaL is the only choice.—*EM*

HoTMetaL Pro 3.0. List price: $159; upgrade from 2.0, $69. SoftQuad Inc., Toronto, Canada; 800-387-2777, 416-239-4801; fax, 416-239-7105; www.softquad.com. *Circle 447 on reader service card.*

SUITABILITY TO TASK

HTML Assistant Pro

	Power	Ease
Simple page creation	Excellent	Good
Complex page creation	Good	Fair
Site management	N/A	N/A

The interface uses a single toolbar for access to the most common HTML tags and to buttons that build more complex features like tables and forms. The top-line menu leads to all HTML 2.0 and many 3.0 tags, but not to any Netscape Navigator or Microsoft Internet Explorer extensions.

The editing window displays raw HTML code. New files are initially empty, so you can quickly create fragments of HTML pages. A single keystroke adds the minimal structure for an HTML page, and a keystroke or a click on a toolbar button launches the current file in a browser.

The package will open any HTML file on your disk. A text-search feature finds and opens HTML files containing specified text, and a well-designed dialog box quickly sets background and text colors. You can preview an image before inserting it in a document. The spell-checker includes a customizable auto-replace feature, and you can tell it to ignore capitalized and mixed-case words. The program won't check your HTML syntax, however.

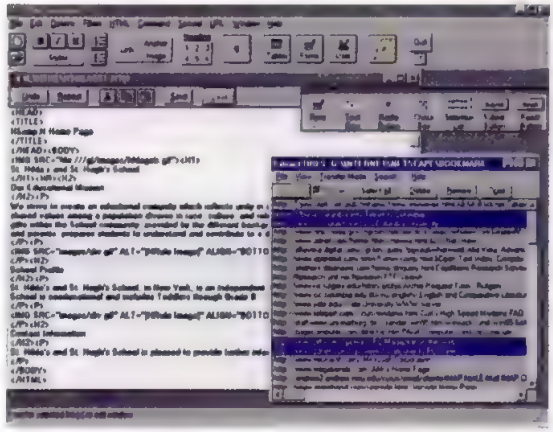
The initially clean interface tends to get cluttered by the floating toolbars and dialog boxes used for creating tables, forms, and links, but most of these toolbars are roll-ups that can be reduced to a narrow strip with a mouse-click.

The admirable form assistant—almost

Brooklyn North Software Works Inc.

HTML Assistant Pro 2

HTML Assistant Pro 2 ($99.95), a 16-bit, code-based HTML editor from Brooklyn North Software Works, offers compact, efficient tools for Webmasters. If you understand HTML syntax, you can use the program's dialog-box "assistants" to enter basic or advanced tags that will build tables and forms. A "URL Assistant" lets you transfer some or all of the links in an HTML file to the editor window (though it won't automatically extract links from an open browser window). Beginners might want to look elsewhere, but even novices can use the dialog box that builds a page of links, images, and text after you fill in some blanks.



HTML Assistant Pro extracts URLs from HTML files to insert links into pages easily.

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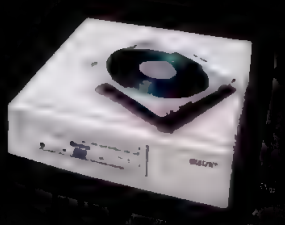

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worth the price of the package by itself—lets you create the required Action tag when you first create a form, and other well-designed dialog boxes add all standard and advanced form tags with minimal effort. If you prefer to hand-create form tags, the form assistant can still save time by inserting the essential tags in your document to be modified later.

The table assistant is less admirable; it lacks the spreadsheet-style interface found in other code-based editors. But it does handle all advanced table tags, and experts can use it effectively to create cells that span rows and columns. Like the forms assistant, the table assistant can insert the essential codes required for a table—with a specified number of rows and columns—and you can fill in the details by hand.

According to the vendor, a major revision of the package is due later this year. Meanwhile, Version 2.0 offers valuable tools to experts who don't need support for cutting-edge HTML extensions.—*EM*

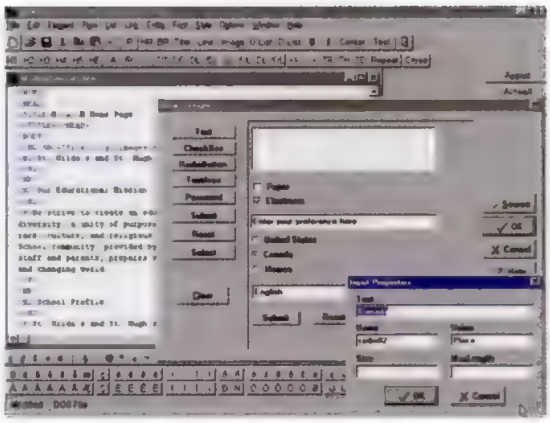
HTML Assistant Pro 2. List price: $99.95. Brooklyn North Software Works Inc., Halifax, Nova Scotia, Canada; 800-349-1422, 902-493-6080; fax, 902-835-2600; www.brooknorth.com. *Circle 448 on reader service card.*

W3 Internet Services Ltd.

HTMLed Pro 32

HTMLed Pro 32 ($99.95), a 32-bit, code–based HTML editor from W3 Internet Services, is a solid, somewhat minimalist program for experts who know how to work directly with HTML code. Beginners can create basic home pages using HTMLed's Page Builder wizard, but they will have to learn HTML syntax before doing much more.

Developed by Internet Software Technologies *(http://www.ist.ca/htmled)*, the most interesting features of the program are its well-designed interactive table editor and an ingenious but incomplete form editor. To build a table, you bring up a dialog box that lets you enter the number of rows and columns you want. Curiously, you can't simply type over the default numbers; you have to change them with the arrow keys or spin buttons. Then you click on a miniature spreadsheet, where you enter text for headers and cells. HTML code for the table is automatically inserted into your file, but if you select the code and open the table designer again, it won't display the original table, and you must recreate it from the start or modify the raw code.



HTMLed Pro 32 makes forms a snap. It inserts the tags; you add the text and the "action."

The form designer creates the input tags needed for a form, but you'll probably have to fill in some details by hand. You use this module by dragging buttons with labels such as "radio," "input," and "reset" into a special form-design window. When a button is in the window, you can right-click on it to set its properties. When you're through, tags are inserted in your code in the order in which they appeared in the window. You have to add the required "Action" field by hand and figure out for yourself how to make a form usable (by, say, specifying the codes that determine which among a group of radio buttons will be selected by default).

The interface uses an editing window, where you work with raw code, and five toolbars, on which most of the buttons are mercifully labeled in plain English instead of with obscure icons. Buttons above the editing window manage files, insert standard tags, and bring up dialog boxes for creating links or inserting images. Three toolbars below the editing window are for inserting special characters, and at the right of the window is a blank bar that you can populate with custom buttons. This separate user-definable toolbar lets you insert any text string, or codes that the program doesn't support. The program supports HTML 2.0 and some 3.0 tags, but if you want to work with any of the newer features supported by Netscape Navigator 2.0 or Microsoft's Internet Explorer, you'll have to enter the codes by hand.

The program can open files directly from the remote server where you keep your site, and it can save the files back to the site when you're finished editing. The program opens and saves files without checking syntax, though.

Useful features include a spell-checker, a multiple-document interface, and intelligent import of .RTF files. A unique convenience lets you add tags or special characters to the right-click menu. Anyone looking for a compact and unpretentious HTML editor should consider HTMLed Pro 32.—*EM*

HTMLed Pro 32. List price: $99.95. W3 Internet Services Ltd., Liverpool, Nova Scotia, Canada; 800-349-1422, 902-354-7464; fax, 902-354-7154; www.eucanect.com/software. *Circle 449 on reader service card.*

SUITABILITY TO TASK

HTMLed Pro 32

	Power	Ease
Simple page creation	Excellent	Good
Complex page creation	Good	Fair
Site management	Good	Good

InContext Corp.

InContext Spider 1.2

Don't expect InContext Spider 1.2 to look or act like any other HTML editing tool. InContext Corp.'s $79 package doesn't display raw HTML tags, but it's not fully WYSIWYG either. Its graphically elegant interface seems to be designed for nontechnical users and is loaded with templates and images, including sample Java applets. InContext Spider also boasts features like a button that embeds multimedia files. But when you try to add other complex elements such as tables, forms, or frames to your page, this apparently easy-to-use product suddenly expects you to be an HTML expert and offers help only through its Web site.

InContext Spider's interface makes page creation look as if it'll be easy. HTML files are structured in an outline-style list of tag names in a panel on the left, and the content appears in a panel on the right. Two toolbars give quick access to standard

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‡Prior to purchase, please contact your local dealer/distributor for the correct version to ensure compatibility with the ISDN switches in your area.

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SUMMARY OF FEATURES

HTML Authoring Tools

■ YES ▨ NO

Products listed in alphabetical order	Alchemy	Backstage Designer Plus	CorelWeb. Designer	DeltaPoint QuickSite	GNNpress	HotDog32	HoTMetaL Pro 3.0
List price	$129.00	$99.00	$149.00	$99.00	Free	$99.95	$159.00
General Features							
WYSIWYG editing	▨	■	■	▨	■	▨	■
HTML source code editing	■	■	■	■	■	■	▨
Wizards/Templates	▨ ▨	▨ ■	▨ ■	■ ■	▨ ■	■ ■	▨ ■
Interactive tag help	▨	▨	▨	■	■	▨	■
User-defined tags	■	▨	▨	▨	▨	■	■
HTML code validation	■	■	■	▨	■	■	■
Table editor	▨	▨	▨	■	■	■	■
Frames editor	▨	▨	▨	▨	▨	▨	■
Image editor	▨	■	■	▨	▨	▨	■
Forms editor	▨	■	■	■	■	■	■
Netscape/Microsoft extensions	■ ▨	■ ▨	■ ▨	■ ▨	■ ■	■ ■	■ ■
Java	■	■	▨	■	■	■	■
ActiveX	▨	■	▨	▨	■	■	■
Supports embedding of Netscape plug-in files	▨	■	▨	▨	▨	■	■
Online help	■	■	■	■	■	■	■
Web/phone support	■ ■	■ ■	■ ■	■ ■	▨ ▨	■ ■	■ ■
Toll-free support	▨	■	■	▨	▨	■	▨
Integrated Importing							
HTML	■	■	■	■	■	■	■
Generic text	■	■	■	■	■	■	■
Microsoft Word	▨	▨	■	▨	▨	▨	■
WordPerfect	▨	▨	■	▨	▨	▨	■
Preformatted text	■	▨	■	■	■	■	■
Tables (such as Microsoft Excel and Lotus1-2-3)	▨	▨	▨	▨	▨	▨	▨
Graphics							
.GIF/JPEG	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
.BMP/.PCX	■ ■	▨ ■	▨ ■	▨ ▨	▨ ▨	■ ▨	■ ■
Client-side image maps	■	▨	■	▨	■	▨	■
Server-side image maps	■	■	■	▨	■	▨	■
Link Support							
Link verification	■	▨	▨	▨	■	■	■
Live surfing for links	▨	▨	▨	▨	▨	▨	▨
E-mail (supports MailTo: tag)	▨	■	■	■	■	■	■
FTP/telnet	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Remote-Site Grabbing							
Get HTML page	■	▨	▨	▨	■	▨	■
Get graphics/backgrounds	■ ■	▨ ▨	▨ ▨	▨ ▨	■ ▨	▨ ▨	■ ■
Retrieve Java/sound/objects	■ ■ ■	▨ ▨ ▨	▨ ▨ ▨	▨ ▨ ▨	■ ■ ■	▨ ▨ ▨	■ ■ ■
Retrieve whole site (more than one page)	■	▨	▨	▨	▨	▨	▨
Site mapping (graphical view of remote site)	■	▨	▨	▨	■	▨	▨
Site Management							
Integrated FTP client	■	■	▨	■	▨	■	▨
HTTP Put support	▨	▨	▨	▨	▨	▨	▨
Converts local links to Web	▨	■	▨	■	■	■	■
Local/host directory management	■ ■	■ ■	▨ ▨	■ ▨	■ ▨	▨ ▨	▨ ▨
Uploads only updated information	■	▨	N/A	▨	N/A	▨	N/A
Server-Side Support							
CGI programs	▨	■	■	▨	▨	▨	■
Bots or agents	▨	▨	▨	▨	▨	▨	▨
Cookies	▨	▨	▨	▨	▨	▨	■
Security	▨	▨	▨	▨	▨	▨	▨
Hidden fields	▨	▨	▨	▨	■	■	■
Limited lifetime pages	▨	▨	▨	▨	▨	▨	▨

N/A–Not applicable: The product does not upload data. * This features is not enabled in the beta version reviewed but is expected in the final shipping product.

	HTML Assistant Pro 2	HTMLed Pro 32	InContext Spider 1.2	Microsoft FrontPage	Netscape Navigator Gold 3.0	Quarterdeck WebAuthor 2.5	Webber	WebEdit Professional Edition 2.0	WEB Office
	$99.95	$99.95	$79.00	$149.00	$39.00	$49.95	$30.00	$79.95	$499.00

THANKS TO A BRAND NEW
TECHNOLOGY CALLED
CROMACLEAR, OUR
COMPETITORS CAN SEE
THEIR DARK, DISMAL
FUTURES IN GREATER
DETAIL AND WITH
UNPRECEDENTED CLARITY.

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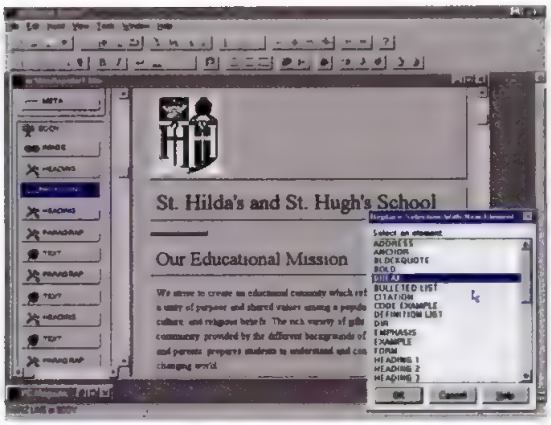
CIRCLE 157 ON READER SERVICE CARD

formatting and other features. Conveniences include a button to send pages to remote sites via FTP and a dialog box for selecting any link currently displayed in your Web browser to insert into your page.

But you have to understand complex HTML coding to create anything beyond simple page elements. When you create a Submit or Reset button in a form, all you see in the editor is a small box. You have to select it and right-click it to display its properties to see what it is, or to preview it in a browser. You can link a graphic to a file using drag and drop from Explorer into the editor, but to modify its position or other properties, you must use a dialog box, and there's no explanatory material. The most common tags can be inserted from a toolbar; the others are available only from an alphabetical, uncategorized list. Many features are accessible only from toolbars and not from the menus or the keyboard.

The program treats HTML files as elaborate outlines; each tag or element is a substructure of another element. You can click on a button to collapse the display of an element into a small symbol. Depending on the cursor's location, this feature can helpfully minimize a table or form while you work on something else, or it can reduce a list of links to a useless stack of meaningless characters.

InContext Spider can wreak havoc on HTML pages created by other programs, a byproduct of its roots as an editor of the far more rigid SGML. Although the program supports recent HTML tags and Netscape extensions in files it creates, it won't understand the same tags in files with headers that vary from the strictest standards. A test file that displayed perfectly in both Netscape Navigator and Internet Explorer generated 42 errors in InContext Spider. Worse, when we saved the file, the code that InContext Spider didn't recognize had been converted into text, rendering the original file useless. In-



InContext Spider mixes a quasi-WYSIWYG editor, dialog boxes for HTML tags, and a nonstandard tree display in its interface.

Context Spider's only import feature uses the Clipboard and can usually convert word processor headings into HTML headings.

InContext Spider suffers from an eccentric interface that isn't close enough to WYSIWYG for casual users yet at the same time puts barriers in the way of experts who want to enter raw HTML code. But it's an intriguing experiment, and you might want to try it for its support for Java applets.—*EM*

InContext Spider 1.2. List price: $79. InContext Corp., Toronto, Ontario, Canada; 800-263-0127, 416-922-0087; fax, 416-922-6489; www.incontext.com. *Circle 450 on reader service card.*

SUITABILITY TO TASK

InContext Spider

	Power	Ease
Simple page creation	Fair	Fair
Complex page creation	Fair	Fair
Site management	Good	Good

Microsoft Corp.

Microsoft FrontPage

PC MAGAZINE EDITORS' CHOICE

Microsoft got its money's worth when it paid a reported $100 million for Vermeer Technologies, the company that wrote the first version of FrontPage. Webmasters who pay $149 ($109 if you own Microsoft Office) for Version 1.1 of this dazzling package will also get their money's worth when they use it to build high-powered, high-tech Web sites without writing a line of HTML code. FrontPage, a 32-bit program that runs on Windows 95 or Windows NT, almost effortlessly builds forms, tables, image maps, frames, and search engines into your Web pages and makes it just as easy to create ordinary links, images, and text.

Installation is a straightforward matter of following the prompts. About 10MB of your disk is devoted to FrontPage's editing software and template and sample files, and to Personal Web Server, which lets a standalone machine act like an http server. Personal Web Server lets FrontPage navigate the sites you create in the same way a browser navigates remote sites.

FrontPage's editing software comprises two interlinked components: Explorer, which creates and manages full Web sites, and Editor, in which you create pages and links. Explorer displays a site's organization in two panes: a hierarchical outline view and a link view that displays the links to and from individual pages in a wheel-and-spoke format. When you click on a page in either view, the page opens in Editor.

You create a web in Explorer by using one of the supplied wizards, which walks you through the basics of creating corporate Web sites or a specialized Web site for discussion groups. A variety of separate templates set up basic personal or customer-support sites. You customize a site using automated "bots" that update links or fill in the address of the corporate Webmaster in mailto and similar fields. Webs are password-protected and are easily copied or moved en masse to remote computers that have FrontPage installed. Microsoft has posted no-charge FTP-style tools on its Web site to simplify uploading to other sites, although you'll have to wait a few months for tools that will let you use FrontPage's built-in search engines and form-handling on other remote systems.

The Web-page Editor program is fully WYSIWYG and won't let you modify the HTML code that it creates, though a special tool lets you enter individual codes by hand, and you can choose a default editor like NotePad to edit pages in raw form. You create and format text using toolbars, menus, and keyboard shortcuts like those in Microsoft Word. FrontPage im-

SUITABILITY TO TASK

Microsoft FrontPage

	Power	Ease
Simple page creation	Excellent	Excellent
Complex page creation	Excellent	Excellent
Site management	Excellent	Excellent

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SMALL BUSINESS
TO YOUR
HOME OFFICE...
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PC MAGAZINE EDITORS' CHOICE
JUNE 25, 1996
MILLENNIA P166

PC MAGAZINE EDITORS' CHOICE
JUNE 25, 1996
MILLENNIA P133

PC MAGAZINE EDITORS' CHOICE
AUGUST 1996
MILLENNIA TRANSPORT P133

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Designed for Microsoft® Windows®95

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NEW

PC Computing EDITORS' CHOICE June 25, 1996 Millennia P166

PC Computing EDITORS' CHOICE June 25, 1996 Millennia P133

PC Computing ★★★★★ July 1996 Millennia P166

Millennia P200 Plus

- Intel 200MHz Pentium processor
- 512KB pipeline burst cache, flash BIOS
- PCI 32-bit Ultra SCSI Fast-20 controller
- 8X SCSI CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- PCI 64-bit 3D video, MPEG, 4MB EDO
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows 95 & MS Plus! CD
- 5-year/3-year Micron Power warranty*

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PC Magazine BEST OF 1995 January 9, 1996 Millennia line

PC World May 1996 Millennia P166 and Millennia P133

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- Samsonite® nylon carrying case
- Microsoft® Windows® 95 and MS® Plus! CD
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- 5-year/3-year Micron Power™ limited warranty*

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†† Lock secures both Millennia TransPort and MicroDock

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- 1.2GB removable hard drive

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- 12.1" active matrix color display, 800 x 600
- 1.2GB removable hard drive
- 2nd lithium-ion battery

$5,199 Business lease $163/month

NEW

PC Computing EDITORS' CHOICE August 1996 Millennia P133

PC Computing 5 STARS! APRIL 1996

Options

With 150MHz Pentium processor	add	$200
With Motorola Montana 28.8 fax/modem	add	$299
With 3Com® Ethernet 10BT PCMCIA	add	$149
With Samsonite® leather bag	add	$99
With 2nd modular lithium-ion battery	add	$199
With 2nd 1.2GB hard drive	add	$599
With 2nd 2.0GB hard drive	add	$699
With 16MB DIMM module upgrade	add	$349
With 32MB DIMM module upgrade	add	$749

Home MPC P133

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- 256KB pipeline burst cache, flash BIOS
- 16MB EDO RAM • 1.2GB EIDE hard drive
- 8X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- 28.8 fax/modem, speakerphone, voice mail
- Microsoft® Phone telephony software
- Internet ready: Internet in a Box from CompuServe®/Spry Internet Explorer
- Prodigy®, America Online® & CompuServe trial memberships
- PCI 64-bit 3D video, MPEG, 2MB EDO
- 15" Micron 15FGx, .28dp (13.7" display)
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows® 95 & MS® Plus! CD
- Quicken® Financial Pak includes: Quicken Deluxe 5.0; Quicken Financial Planner™; Quicken Parents' Guide to Money™; Quicken Family Lawyer™
- Microsoft Home Pak includes: Works 4.0 for Windows 95; Publisher Deluxe for Windows 95; Encarta® 96; Encarta 96 World Atlas; Music Central™ 96; Wine Guide; Arcade 1.0; Scenes—Sports Extremes Collection; Cinemania® 96; Julia Child Home Cooking; Best of Windows Entertainment Pack; CD Sampler (including Fury³ game demo)
- 5-year/3-year Micron Power™ warranty*

$1,999

- With 166MHz Pentium processor.....add $200

net ready

PC Magazine EDITORS' CHOICE May 16, 1995 Home MPC P90

Family Computing RECOMMENDED May 1996 Home MPC P133

intel inside pentium

Home MPC P200

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- 8X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit 3D Wavetable stereo sound card
- Advent AV270 2x25 watt stereo speakers
- 28.8 fax/modem, speakerphone, voice mail
- Microsoft Phone telephony software
- Internet ready: Internet in a Box from CompuServe/Spry Internet Explorer
- Prodigy, America Online & CompuServe trial memberships
- PCI 64-bit 3D video, MPEG, 2MB EDO
- 15" Micron 15FGx, .28dp (13.7" display)
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows 95 & MS Plus! CD
- Microsoft Office Pro 95 & Bookshelf® 95 CDs
- Quicken Financial Pak includes: Quicken Deluxe 5.0; Quicken Financial Planner; Quicken Parents' Guide to Money; Quicken Family Lawyer
- Microsoft Home Pak includes: Works 4.0 for Windows 95; Publisher Deluxe for Windows 95; Encarta 96; Encarta 96 World Atlas; Music Central 96; Wine Guide; Arcade 1.0; Scenes—Sports Extremes Collection; Cinemania 96; Julia Child Home Cooking; Best of Windows Entertainment Pack; CD Sampler (including Fury³ game demo)
- 5-year/3-year Micron Power warranty*

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- With 166MHz Pentium processor.....subtract $100

net ready

PC World February 1996 Home MPC P90

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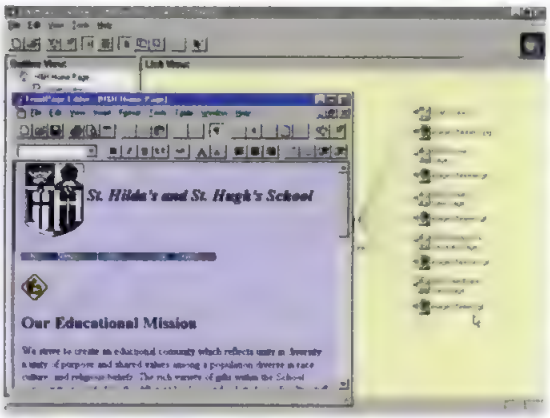
SOHO-PCMGA-9609

ports files in ASCII, HTML, and RTF formats but won't convert word processor files, not even Word's. Virtually any bitmapped image file is automatically converted to .GIF or JPEG format, depending on the color depth of the original. The package has extensive help for the editing programs but only laconic help for the Personal Server.

You create tables as easily as in a word processor, and FrontPage builds a form around any form field you insert. When you add images, links, tables, or forms to your pages, FrontPage inserts usable defaults for each element. Experts can then modify the defaults using the latest Netscape extensions and proposed HTML tags by entering changes to the relevant Properties box. FrontPage supports CGI scripts, but you won't need them because a built-in form processing feature saves results in a variety of formats suitable for importing into a database, viewing in a browser, and so forth. To create client-side image maps, you simply draw a box on a graphic, and a dialog box pops up, in which you define the link.



Creating your site with FrontPage means looking at the big picture, not arcane HTML tags.

FrontPage is the most complete and innovative Web site editor on the market, and also one of the easiest to use. If you enjoy wrestling with HTML code, you'll prefer a standard HTML editor, but if you want to create a large, consistent Web site with minimal stress and strain, turn immediately to FrontPage.—*EM*

Microsoft FrontPage 1.1. List price: $149 ($109 for Microsoft Office users). Microsoft Corp., Redmond, WA; 800-426-9400; www.microsoft.com. *Circle 451 on reader service card.*

Netscape Communications Corp.

Netscape Navigator Gold 3.0

You can't find an HTML editor that's better integrated with a browser than Netscape Navigator Gold 3.0. Unlike the ordinary version of Netscape Navigator, Netscape Communications Corp.'s $79 Gold version (free for academic use) has a WYSIWYG editor built into the browser. It isn't the most advanced editor, and you wouldn't use it to create a corporate Web site, but if you merely want to create a few quick pages, nothing gets the job done faster.

We tested Version 3.0, a beta release. Installation is as simple and straightforward as Navigator itself, adding 12MB to your hard disk if you include the browser's add-on features. You open the editor window from the browser's file menu or with a command line switch that opens the editor without going through the browser. The editing window looks like a standard Navigator window, but with three toolbars at the top: one for character-formatting, graphics, and links; another for file functions; and a third for paragraph-formatting. You create text simply by typing it into the editing window and apply formatting either from the common features on the toolbar or from the more complete lists on the drop-down menus. A toolbar button clears all styles from selected text.

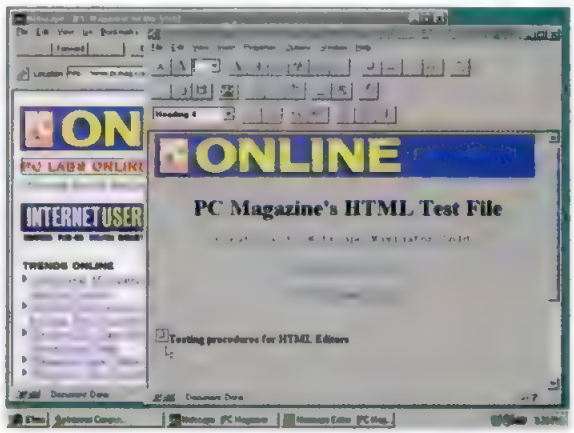
If you insert an image by dragging it to the editor window, you can change its size, position, border, and other features simply by double-clicking on it, which brings up a helpful dialog box with thumbnail illustrations of all available formatting options. You import images into your pages simply by dragging them from the browser window or from Windows Explorer; you create links to remote pages simply by dragging a link icon from the browser window.

Text, links, and graphics can be dragged and dropped throughout the editing window, and you can open multiple editing windows at any time. The table editor was unfinished in the beta version, but using it is already intuitive, with easy access to color and other options.

When you open files that include forms and other elements not directly supported by the editor, the HTML tags that create those elements display as icons that look like garment tags. Double-clicking a tag icon opens a window in which you can edit the raw HTML code; you can insert raw code elsewhere in your file by opening the same window from the menu. A "verify" button in this menu does nothing more than make sure that you've included the required angle brackets around each tag. As long as your tags are surrounded by angle brackets, the editor won't block those tags it doesn't recognize; it will simply display an unknown tag with the "clothing tag" icon. The editor doesn't create any more than the absolute minimum of HTML code required to display your file in a browser.

Navigator Gold creates tables but won't help you build forms or frames. You won't find page-creation wizards or templates in the package, but Netscape's Web site includes on-line wizards and sample templates you can use to create pages that you can refine in Navigator Gold or any other HTML editor. When you're through creating your pages, Navigator Gold uploads them via FTP or http to a remote site.

Navigator Gold won't drive professional HTML editors off the market. But



Editing pages from the Web is a drag-and-drop affair with Netscape Navigator Gold.

SUITABILITY TO TASK

Netscape Navigator Gold

	Power	Ease
Simple page creation	Excellent	Excellent
Complex page creation	Fair	Good
Site management	Fair	Good

if you just want to create a few simple pages quickly, and upload them to your Web site by clicking on an icon, there's no reason to purchase anything else.—*EM*

Netscape Navigator Gold 3.0. Netscape Communications Corp., Mountain View, CA. List price: $79 (free for academic use); 415-528-3777; fax, 415-528-4129; home.netscape.com. *Circle 452 on reader service card.*

Quarterdeck Corp.

Quarterdeck WebAuthor

Quarterdeck WebAuthor 2.5 lets users of Microsoft Word for Windows create home pages without leaving that familiar environment. The $49.95 add-on ships with both the Quarterdeck Mosaic browser and WebImage, a tool for creating and editing image maps and converting and optimizing graphics. We looked at the beta version of the new 32-bit package that works with Microsoft Word 7. WebAuthor leads you through page creation with dialog boxes and is a great choice for first-time Web authors looking for an easy-to-use product.

WebAuthor runs from inside Microsoft Word for Windows, and you create or edit HTML documents as you would any Word document. Oddly, working in WebAuthor doesn't exactly feel like working in Word. For the most part, WebAuthor replaces Word's tools with its own, inserting a toolbar beneath Word's. Still, WebAuthor maintains two versions of your page, a Word version and an HTML version, and editing the Word version is far less daunting than working directly with code.

The easiest way to build a Web page is to create the text elements entirely in Word and then import the document into WebAuthor, letting the product automatically convert it into an HTML document. But that process may be confusing for neophytes, as WebAuthor produces some puzzling messages and ultimately doesn't seem to change the document's appearance, leaving it unclear what you're supposed to do next. A tutorial shows you how to accomplish certain tasks, but it could explain more. WebAuthor would also serve novices better with the addition of some attractive templates.

With your text in place, you can use WebAuthor's robust tools to create a page rich with hypertext links, forms, tables, and images. These elements are accessed via toolbar buttons, each of which calls forth a dialog box that makes insertion a breeze. You can add images and select how they'll align with the text. You can add local and remote links within your page, and though WebAuthor doesn't support copying and pasting of live links, you can insert URLs via an address book (a text file that is easy to update via copy-and-paste). WebAuthor also makes the normally daunting task of form insertion almost effortless.

WebAuthor is only as WYSIWYG as Word—not very—so to get an accurate idea of what your page looks like, you need to view the page in your browser. Luckily, WebAuthor makes this easy with a preview button on the toolbar.

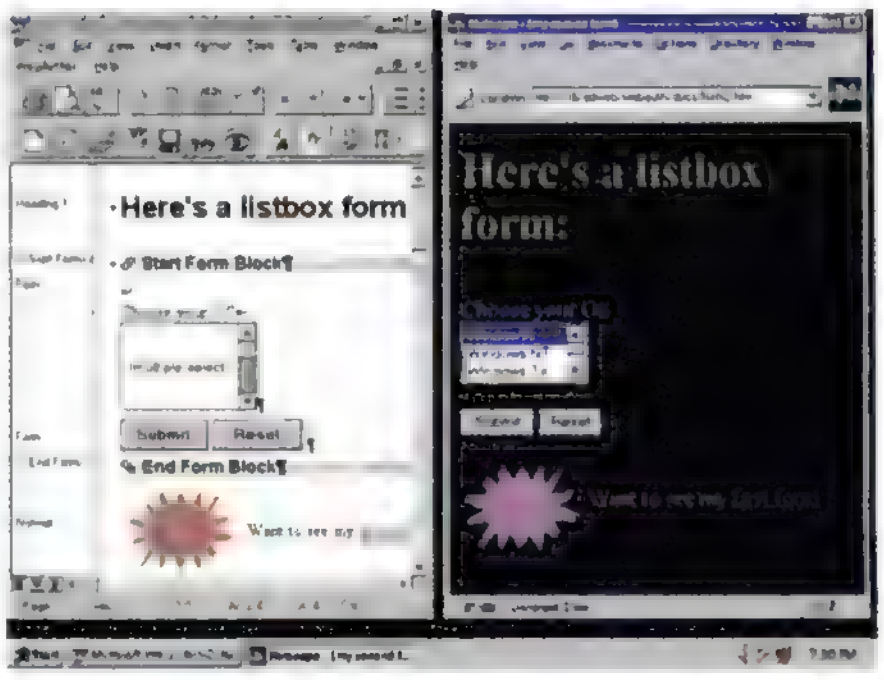
WebAuthor supports importing a page downloaded from the Web. But doing so may force you to make decisions regarding tags the package doesn't support as WebAuthor attempts to validate the code. Version 2.5 supports HTML 2.0, some HTML 3.0 tags, and Netscape extensions. Version 3.0, due later this year, will be more up-to-date with current specifications.

Designed as a document-creation tool, WebAuthor offers no publishing or site management features. Nevertheless, the package fulfills its mission: You really can create attractive Web pages without knowing any HTML. For budding authors who want to get their feet wet before taking the plunge, WebAuthor's familiar Word environment, ease of use, and low price provide a gentle means of testing the waters.—*Sharon Terdeman*

SUITABILITY TO TASK

Quarterdeck WebAuthor

	Power	Ease
Simple Page Creation	Good	Good
Complex Page Creation	Fair	Fair
Site Management	N/A	N/A



WebAuthor may not be a truly WYSIWYG tool, but many tasks, like form insertion, are effortless.

Quarterdeck WebAuthor 2.5. Direct price: $49.95 (free to registered owners of previous versions). Quarterdeck Corp., Marina del Rey, CA; 800-354-3222, 310-309-3700; fax, 800-354-3329; www.quarterdeck.com. *Circle 453 on reader service card.*

Cerebral Systems Development Corp.

Webber

Webber, from Cerebral Systems Development Corp., is a standalone code-based editor with a little something extra: It helps you get started coding HTML. Attractively priced at $30, Webber is easy to use and will validate your pages based on any Document Type Definition (DTD). Cerebral Systems will support any new version of HTML, because the company provides new DTD files as they become available.

Webber supports HTML 2.0, HTML 3.0, and both Netscape and Microsoft extensions. Choosing a DTD in Webber is a fundamental action, since it affects your preview browser, the tags the editor makes available to you, and the validation feature.

Webber's local validation is one of its strong points. Because the editor doesn't constrain what you place in the document, as some editors do in an attempt to prevent you from coding incorrectly, the validation feature is a welcome safety net. When you click the Validate icon, your document is checked against the DTD you specified and invalid tags are succes-

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32MB of 60 NOS RAM Expandable To 512MB	ECC Supported	Slots (6) PCI; (4) EISA	32MB EDO Expandable to 384MB	166MHz Pentium Processor
ECC Supported	SLOTS: (4) PCI, (3) ISA	2940 UW	3 4GB 7200RPM Removable HD	256K Pipeline SRAM
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Open Slots: (3) PCI, (1) ISA	#9 2MB VRAM Video	8x CD-ROM	Slots (4) PCI, (4) EISA	16MB RAM Expandable to 128MB
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sively pointed out in a review dialog.

Webber's designers have no intention of hiding HTML from would-be Web authors. There's no wizard in the standard sense, but a help tutorial gets you started with the basics. In addition to the education you get from the tutorial, Webber provides some ease-of-use features to streamline your page development. Two of these, Tag Assistant and Tagbar, are for basic tag entry.

Tag Assistant is a dialog box that contains a complete list of tags for the DTD you choose. It also lists all possible attributes for the tag you select and gives you help with some of these attributes (providing a color palette for the background color attribute of the Body tag, for example). If Tag Assistant is running, clicking inside a tag's brackets in the editor and then back in the Tag Assistant window displays the options for that tag.

Tagbar is a floating buttonbar for commonly used tags. It is customizable, and it also has tabs along the bottom for different sets of tags, so you can organize them by category. Left-clicking on a button inserts the tag; right-clicking launches Tag Assistant with the options for that tag loaded.

There's also a separate table editor that takes the drudgery out of aligning and sizing your table cells. List Assistant helps you with the simpler task of defining a variety of lists. Entity, Image, and Anchor assistants make entering a special character, image, or link a simple process of filling out a small dialog box. Image Assistant unfortunately lacks the ability to create image maps, and although Form Assistant gives you all the help you need in designing a form, it does not support CGI scripts. What you do with the results from a form must be accomplished outside of Webber.

Purely a document-creation package, Webber offers no FTP, server, or site management features. Also, it doesn't let you pull down content from the Web or import word processing or spreadsheet files to use in your page. A future edition, called Webber/Active, will include an Object Assistant feature to help you embed ActiveX controls into your page. Webber's assistance in helping you learn and code HTML painlessly, its on-site document validation, and its low price make it an attractive option for budding Webmasters.—*Michael Muchmore*

Webber facilitates tag entry with toolbars, dialogs, and the easy-to-use Table Assistant.

Webber, Version 1.3a. List price: $30. Cerebral Systems Development Corp., Toronto, Ontario, Canada; 416-651-6818; fax, 416-651-7685; www.csdcorp.com. *Circle 456 on reader service card.*

SUITABILITY TO TASK

Webber

	Power	Ease
Simple page creation	Good	Good
Complex page creation	Fair	Fair
Site management	N/A	N/A

SmartDesk Inc.

WebEdit Professional Edition 2.0

WebEdit Professional Edition 2.0 ranks among the most elegant and up-to-date code-based Web-page editors. Published by SmartDesk (but developed by Nesbitt Software, *www.nesbitt.com*), this $129.95, 32-bit package is for experts who understand the structural logic of HTML. But it serves beginners as well with a wizard that creates a home page automatically after asking a few questions. Everything about this program has a professional feel that inspires confidence.

In nonwizard editing, you insert headers, tables, forms, and frames by filling in dialog boxes or by editing code directly in an editing window, while a real-time previewer (which can be turned on and off) displays a WYSIWYG view of your file. WebEdit converts delimited database files into HTML tables, organizes multiple files into "projects" that can be opened for editing or uploaded via FTP with one keystroke, and creates client-side image maps. It supports but won't preview frames, Java tags, or ActiveX modules.

WebEdit's uncluttered interface consists of two toolbars and a row of buttons that open drop-down lists of HTML tags. There's even a button for custom tags or menu items that will insert the full contents of separate files. You can simultaneously open as many documents as you can fit into memory, but you can view or preview only one file at a time because of the program's tabbed interface. Unless you use the home-page wizard, every new file is completely empty. Inserting the basic HTML-document template tags is a one-click process. You can also easily create nonstandard pages, such as those that include frames, or fragments of pages that you can drag or import into other pages.

As you move the pointer through the dialog boxes in which you build tags, brief explanatory tips pop up, and the help file includes a superb HTML tag glossary. WebEdit can build or import tables in an interactive table editor, but headers can be added only as separate tags after you return to the main editing screen. The table editor also exports HTML tables as comma-delimited files. Similar interactive editors for frames and forms were not available in the beta version we tested but should be in the final product.

You can drag an icon from the desktop or Explorer and automatically create a link or open the file for editing in a separate window. Unlike HotDog32 (also reviewed here), WebEdit is smart enough to detect that a graphic is a binary file, and it won't demolish the file you're editing by attempting to insert the binary characters of the file into your HTML text. The program imports any HTML file without complaining about

SUITABILITY TO TASK

WebEdit Professional Edition

	Power	Ease
Simple page creation	Excellent	Good
Complex page creation	Excellent	Good
Site management	Good	Good

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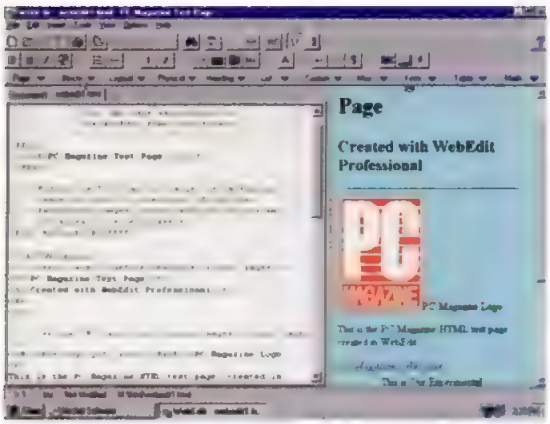


WebEdit Professional Edition features a real-time previewer and categorized menus to access all HTML tags.

errors, and although it includes a "tag-checker" tool, this only warns you if you use tags that aren't recognized by various levels of the HTML standard. The powerful spell-checker lets you specify misspellings to be changed automatically, and it optionally skips over capitalized and mixed-case words. The search-and-replace function operates over all open files. A menu option exports files in Macintosh or Unix format instead of the DOS standard.

WebEdit includes virtually every tool that experts need for creating advanced HTML files. If you're beginning to lose patience with the sloppy interfaces and unreliable performance of other code-based HTML editors, WebEdit is the first place to seek an alternative.—*EM*

WebEdit Professional Edition 2.0. List price: $129.95. SmartDesk Inc., Laguna Hills, CA; 714-582-4020; fax, 714-348-0006; www.virtualdesk.com. *Circle 454 on reader service card.*

Blue Sky Software Corp.

WEB Office

Billed as a one-stop solution for Web-site creation, Blue Sky Software Corp.'s WEB Office is a kitchen-sink collection of loosely integrated tools. The centerpiece of the package is a licensed version of Microsoft's free Word add-on, Internet Assistant for Word for Windows 95. Included in the $499 price are four additional modules that handle Web-site diagnostics, image-map creation, graphics-file management, and help file–to-HTML conversions.

Novices will find themselves able to get fairly complex pages done in a hurry, but more sophisticated users will encounter frustrating limitations and will probably feel that the hefty list price cannot be justified with so many excellent and inexpensive tools available. WEB Office also includes the Microsoft Internet Explorer 2.0 browser and a licensed copy of Paint Shop Pro 3.12, an elegant graphics editor.

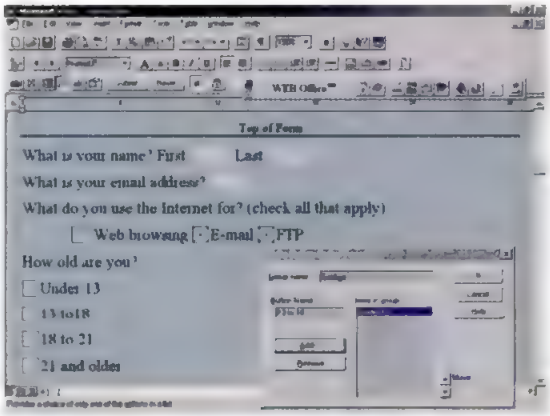
Internet Assistant, WEB Office's HTML authoring component, is one of the better tools for creating HTML pages in a WYSIWYG word processor environment. Its simple dialogs and toolbar buttons made it easy for us to create the basics, including header and body formats, lists, embedded graphics, hyperlinks, and HTML tables. We also easily built interactive forms with text fields, radio buttons, check boxes, and list boxes. Internet Assistant handles Microsoft's proprietary HTML extensions (such as marquees and static backgrounds) seamlessly, but it does not support Netscape extensions like frames.

Any document that can be opened in Word can be saved in HTML format, allowing easy conversions. A Web Browser view roughly approximates what your finished pages will look like, but we found that it didn't accurately represent pages containing sized graphics or forms.

WEB Office's Web Doctor is an efficient and useful tool that quickly tests all internal and external links you've added to your site (a mammoth task if done manually). It then generates a detailed HTML report showing pages with broken links, pages with missing images, and unused (dead) pages. It also gives you an alphabetic listing of all pages and all images and a performance report showing download times for each page at different baud rates. All links in the HTML report are live, so you can jump right to any offending page or element immediately. Web Doctor, however, is not integrated with the HTML editing tools you need to fix the problems it finds. The program can check only local or network files; it can't check a Web site across the Internet. This is unfortunate, because uploading files to a Web server can be a major source of broken links.

HotSpot Studio is an image-map creation tool that lets you add hyperlinked hot spots to graphics. You can create multiple rectangular, circular, or free-form hot spots and save the image map either in NCSA or CERN format or as a client-side image map. HotSpot Studio also lets you convert .BMP and .PCX files to .GIF and .JPG files and create transparent or interlaced .GIFs. You can associate a new graphic with an existing image map, which opens interesting possibilities for sites that need frequent makeovers.

WEB Office's tools and excellent documentation will quickly turn novices into productive page authors. But with several of its core modules available as freeware or shareware, including Internet Assistant, its value ultimately rides on its homegrown diagnostic tools and its image-map editor. Given their limitations, it's tough to justify WEB Office's high price.—*Thomas Mace* □



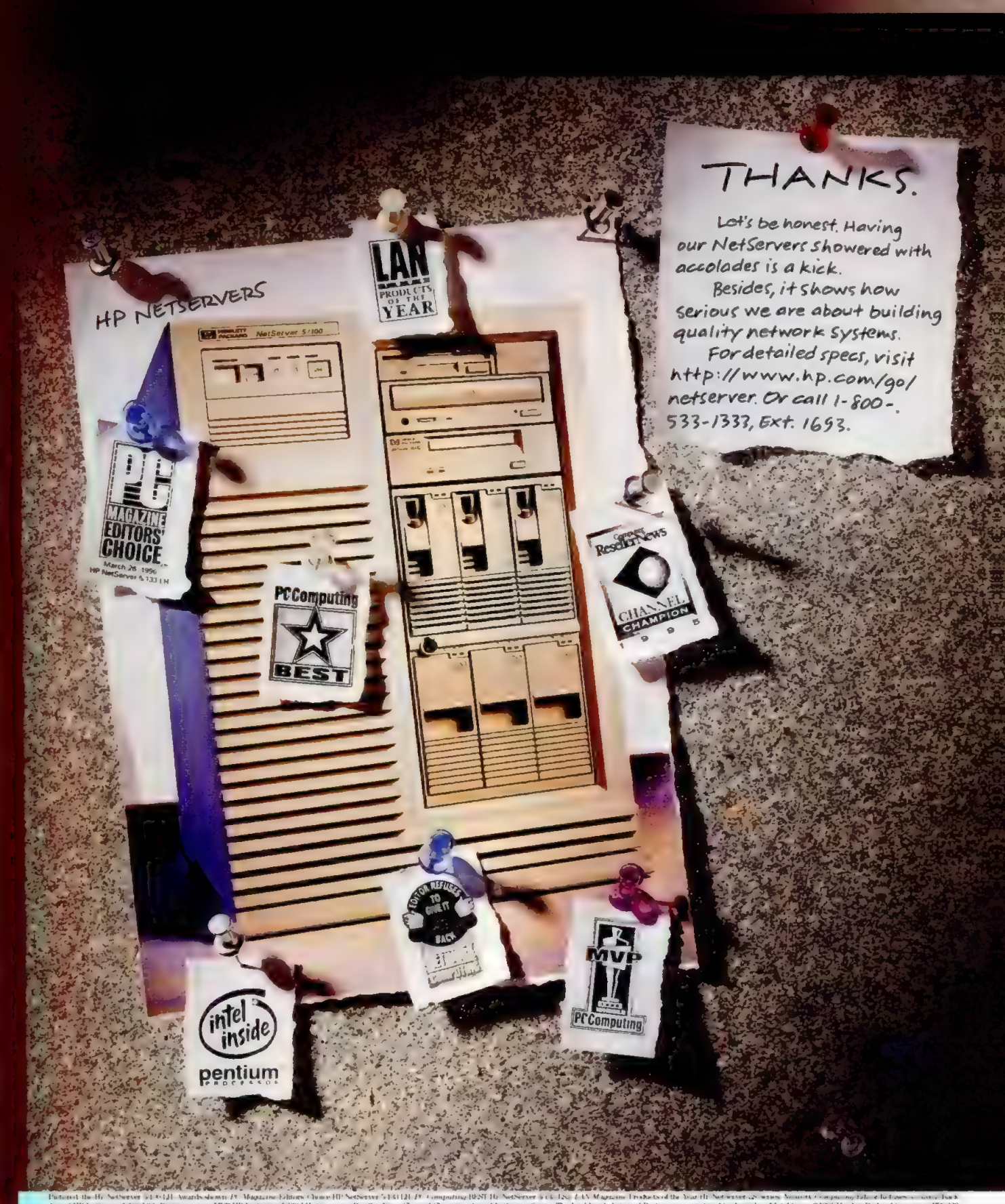
Microsoft Internet Assistant is WEB Office's HTML editor, making form-building simple.

WEB Office. List price: $499. Blue Sky Software Corp., La Jolla, CA; 800-571-9764, 619-459-6365; fax, 619-459-6366; www.blue sky.com. *Circle 455 on reader service card.*

SUITABILITY TO TASK

WEB Office

	Power	Ease
Simple page creation	Excellent	Excellent
Complex page creation	Fair	Good
Site management	Poor	Good



Pictured: the HP NetServer 5/100 LH. Awards shown: *PC Magazine* Editors' Choice HP NetServer 5/133 LH; *PC Computing* BEST 16- NetServer 5/166 LH; *LAN Magazine* Products of the Year HP NetServer LX Series; Network Computing Editor's Choice Award HP NetServer 5/100 LS6; *PC Computing* MVP HP NetServer 5/100 LH; *Computer Reseller News* Channel Champion Award NetServer Series. The Intel Inside logo and Pentium are registered trademarks of Intel Corp. ©1996 Hewlett-Packard Company 1F9-633

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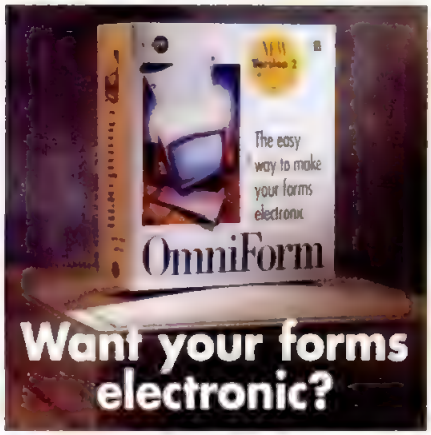

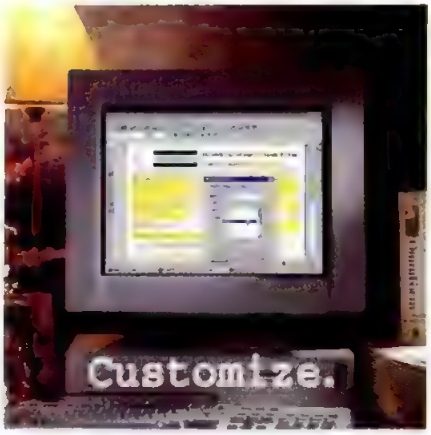

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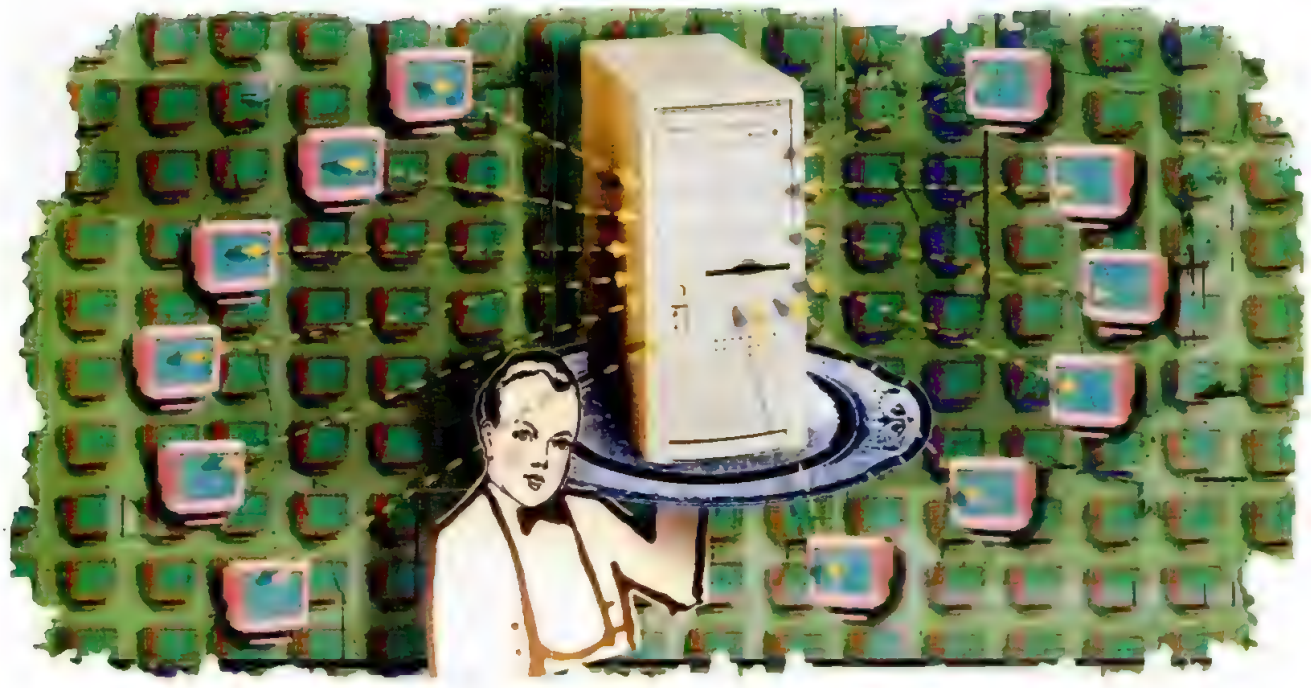

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What's New Online
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Web Servers

Today's Web servers dish out live data, multimedia, and user-personalized information. But which Web servers meet these demands?

By Robert P. Lipschutz

Although not seen by most users, Web servers are the unsung heroes of the Internet. Web traffic dominates the Internet today, and each and every Web page or graphic comes from a Web server. The flashier Web browsers like Netscape Navigator and Microsoft Internet Explorer may get all the attention, but without the Web server, there would be no Web.

Don't think all Web-related fun is limited to the Internet, however. For every one Web server used by companies to deploy an Internet site, tens or even hundreds are being deployed inside companies for internal Web sites, also known as intranets. Web servers promise to become a major addition to the corporate network. Intranets

usually start life as vehicles for providing employee access to corporate information, but intranets also show great promise for collaboration, messaging, workflow, and many other corporate network functions (for more on intranets, see "The Web Within," April 23, 1996).

The Web was born to publish hypertext documents in an appealing graphical format, but now everybody's talking about how to extend its features. Users want personalized page content. Many companies want Web pages that pull information from databases and derive user-configurable reports. And we'll see Web servers evolve to serve these challenges.

REVIEW CRITERIA

We looked at 12 Web server software products running on five operating systems and three hardware platforms. We looked for products from vendors that could claim at least 1 percent of the Web server market, based on data from Web Compare and NetCraft—two private organizations that survey a random sample of Web sites. To make sure we covered products that run on all major operating systems, we also looked at Quarterdeck's WebStar for Macintosh, Novell's NetWare Web Server; and IBM's Internet Connection Secure Server for OS/2 Warp. All the products reviewed support Secure Sockets Layer (SSL) 2.0 except NetWare Web Server.

We tested Netscape FastTrack and Enterprise servers on Microsoft Windows NT 3.51 and Sun's Solaris 2.5. Four other Windows NT products—Microsoft Internet Information Server (IIS), Process Software's Purveyor Encrypt WebServer, The Internet Factory's Commerce Builder Pro, and O'Reilly's WebSite Professional—were also tested. We rounded out our testing with Community ConneXion's Stronghold: Apache-SSL-US on Solaris.

We looked at a number of areas when evaluating these Web servers: setup, configuration, server management, administration, content management, security, access control, application development features, and performance.

> Standalone Web server software may eventually become a thing of the past as it merges with operating systems or other back-end applications.

WHAT ARE THEY?

Web servers are really very simple in their operation. Web browsers communicate with Web servers using Hypertext Transfer Protocol (HTTP), a simple request/response protocol for information transfer using TCP/IP. The Web server receives the request, retrieves the file, sends it to the browser, and then tears down the connection. The graphics in the page are serviced the same way. Browsers then display the downloaded HTML document.

Although Web servers typically store HTML pages and graphics, a Web server can store and serve up any kind of file in-

Behind the Screens

Web servers manage complex requests behind the scenes, cloaking their maneuvers behind the simple-looking browser interface. Below, we've constructed a virtual PC Magazine Online page to show you how Web servers fill the page.

Virtual servers On a single machine, you can designate multiple virtual servers with different domain names and IP addresses. Here, we've set up two: www.a.com and www.b.com.

HTTP requests Your Web browser retrieves HTML pages from a Web server using HTTP, the fundamental communications protocol of the World Wide Web. In essence, an HTTP request defines a document name and location.

CGI programs Filling in this form activates a CGI script that searches a database and returns the search results in the frame below.

Virtual paths This file is not located on the same machine as the Web server, so the corresponding URL is a virtual path (*www.a.com/doc2.htm*), which points to a document on a separate file server (located at c:\web\doc2.htm).

Java applets This animated Java applet is embedded in the HTML page, which downloads the necessary Java classes from the Web server. The applet then executes in the defined portion of the page.

Image maps When you click on the Search portion of this server-side image map, the Web server translates the coordinates of the point you clicked on (for example, 115 pixels by 5 pixels) to a target URL (such as *www.a.com/search. htm*) and sends back the resulting page.

Audio streaming When you launch a multimedia object, such as a RealAudio file, the Web server directs the request to a separate media server. The media server sends back the file in a stream, so you don't have to wait for the entire file to begin playback.

cluding text files, word processing documents, video, or audio. Today, with the exception of user-filled-out forms, most Web traffic is one-way—browsers read files from the Web server—but that will change with wider adoption of the HTTP 1.1 draft method called *put*, a way to write files to a Web server. Today, put is used mostly by Web authors, but it could be used in the future by end users for collaboration.

A Web server also runs applications, the most common being search engines or database connectivity processes. Standards like the Common Gateway Interface (CGI) and scripting languages like JavaScript, as well as full programming languages like Java and Visual Basic, are being used for this. Basic search engines, included with five of the Web servers in this review, help users sort out the information they need, and database connectivity applications connect Web browser users to databases.

Down the road, standalone Web server software may become a thing of the past as it merges with operating systems and other server applications. New hybrid Web servers combine HTTP services with more sophisticated information-processing tools. For example, Lotus Development Corp.'s Domino family of Web server products enables developers to expose Lotus Notes' features and programmability to any Web browser client.

Enterprise Web server:

Netscape Enterprise Server

Departmental intranet Web server:

Microsoft Internet Information Server

Web servers support everything from small departmental intranets to major Web sites sending HTML pages to millions of Net surfers.

If you're looking for a Web server for a large commercial enterprise and you expect Web page creation and management to be shared by several persons and departments, we recommend Netscape Enterprise Server. Not only did Enterprise Server running on Windows NT Server achieve top-notch scores on our performance tests, but it also comes with all the features and functions necessary to build and maintain a large Web site. These include SSL 3.0 with client-side certificate authentication, an integrated search engine from Verity, SNMP support, sophisticated Web site content management, and excellent development tools for connecting to databases.

With Enterprise Server's MKS Integrity Engine, you can implement document check in and check out to make sure that those involved in content creation don't overwrite each other's Web pages. And MKS keeps all previous versions of Web documents organized on the server for easy retrieval if necessary. Finally, Enterprise Server is available on a smorgasbord of platforms, including various flavors of Unix and Windows NT.

For departmental intranets, we like Microsoft Internet Information Server. It's available free from Microsoft's Web site and will be included with Windows NT Server 4.0, though you do have to purchase the server operating system. But price isn't the only issue here. IIS provides easy setup and configuration; offers good integration with Windows NT's access control, Performance Monitor, and Event Viewer; and supplies several tools for generating live data from databases. And IIS was blazingly fast on our tests.

O'Reilly's WebSite Professional deserves an honorable mention for its complete package, outstanding documentation, and exceptional ease of use. Unfortunately, WebSite Pro was one of the slower performers on our tests. Still, for all but the busiest Web sites, WebSite Pro should fill the bill.

WHAT WE FOUND

Most of the Web servers set up quickly and easily. O'Reilly's WebSite had the best documentation of the group, with an outstanding manual and context-sensitive online help. At the other end of the spectrum is Stronghold: Apache-SSL-US. For experienced Unix gurus only, this Web server includes little documentation but does allow you to rewrite its source code, thus staying true to its Unix roots.

The most challenging part of setup is configuring multiple domain names on the same physical box, a feature known as *virtual servers*. This is useful if you are an Internet service provider hosting more than one company's Web site, or if you are hosting multiple departments' sites in an intranet.

Typically this is done by configuring multiple TCP/IP addresses on the server, one for each domain name, and then mapping each domain to its own document directory. All the products except NetWare Web Server and IBM's Internet Connection Secure Server had this feature. We found a few twists also. Netscape provides what it calls software virtual servers, which use information contained inside the HTTP request header to map to the

Our Contributors: ROBERT P. LIPSCHUTZ is technical director for networking at *PC Magazine*. LES FREED is a networking writer and a frequent contributor to *PC Magazine*. JOHN GARRIS is a freelance writer and consultant. ERIC HARPER is a networking consultant. ANDREW GO is a support technician and ALEX C. HO is a project leader at *PC Magazine*. FRANK J. DERFLER, JR., is the senior networking editor of *PC Magazine*. SEAN GONZÁLEZ is a project leader for the Internetworking Solutions group at the Boston-based Information Access Group. DAVID S. LINTHICUM is an independent consultant. LEON ERLANGER was the senior associate editor in charge of this story, and JEFFREY G. WITT was the project leader.

HIGHLIGHTS

Web Servers

The Web server was designed to be invisible. Whether you're connecting from the corporate network or over the Internet, you don't need to know where the information resides or how it gets to your doorstep. Most of today's Web servers can easily handle simple file requests, but they are increasingly being used as vehicles for linking browser users to complex back-end applications like corporate databases.

Performance is important, of course, but just how important it is depends on what sort of Web site you're setting up. A small or medium-size intranet, for example, may not need to handle the thousands of requests per hour that a server exposed to the Internet would expect to receive. All of the Web servers we tested showed performance results that were adequate for hosting just about any Web site, but the servers from Novell, Netscape, and Microsoft stood out from the rest. Factors such as processor speed, RAM, and connection speed may affect performance more than the Web server itself.

Ease of use may seem like a foregone conclusion; after all, we're talking about the Web. Not exactly. The browser-based configuration and management offered by six of the products reviewed turned out to be slower and less intuitive than the proprietary Windows NT–based management utilities that came with Microsoft IIS and O'Reilly's WebSite Professional. And graphical interfaces were preferable to the character-based installation and management required by the Unix-based Apache server.

Security is crucial as Web servers move into intranets and as Internet commerce becomes more prevalent. Secure Sockets Layer (SSL), a standard for encrypting passwords and data, requires you to pay for and obtain a server certificate from a third-party certificate authority. All the Web servers reviewed include basic authentication, which requires a user name and password to access restricted pages; some even use the underlying NOS's user database. We expect Web servers to include certificate-generating capabilities in the near future, greatly easing the implementation of strong Web security.

Server-based applications and database connectivity have come to the forefront in Web servers. All the servers in this roundup support the basic Common Gateway Interface (CGI) standard, but CGI programs have limited capabilities and tend to be inefficient. Beyond CGI, several Web server vendors have developed application programming interfaces (APIs)—like the Netscape Server API and the Internet Server API developed by Microsoft and Process Software—which allow developers to directly access specific functions on the Web server. Some servers include database-connectivity middleware, which may require a good level of programming knowledge; others support server-based Java applications.

Content management tools are included with several Web servers to ease the headaches of developing a Web site. Besides HTML editors and document format converters, some of the most useful are URL checkers (like Process Software's Link Browser and O'Reilly's WebView), which ensure that all the hypertext links on your Web site are valid.

appropriate content directory.

We looked at local management—managing the server from its console—and remote management—managing the server from another computer on the network. We were impressed by products with full feature sets presented in an easy-to-use interface. O'Reilly's WebSite Professional and Process Software's Purveyor Encrypt WebServer have easy-to-use tab screens for local management. IBM's Internet Connection Secure Server had the nicest browser-based interface. Although we liked the fact that Netscape's servers used a browser for all management, the interface itself was a bit clumsy. Microsoft IIS has a clean interface with basic functions.

Remote management was a different animal altogether. Both WebSite Professional and Commerce Builder Pro require installation of the entire product on the management station. We found this inconvenient since we wanted only the management interface, not the whole product. We think platform-independent browser interfaces make the most sense in the long term, but the somewhat clunky interfaces we saw attest to the difficulty of doing them well.

MANAGING CONTENT

We also looked at content management tools. We examined site management tools, which provide an overall view of the organization of the Web site, and tools to check the validity of internal and external hypertext links. Netscape's LiveWire, which comes with Enterprise Server and is offered as an option with FastTrack, includes a site management utility listing all links for any selected page; it cumulatively reports all bad links for a site. O'Reilly's WebView does the same thing by showing a large tree of files, with bad links shown in red.

We also looked at some more basic content management options. Web administrators must decide where the files are stored and how they are accessed by users browsing your site. This is done by mapping logical URLs to physical directories. Each of the products has a way to do this, but we liked O'Reilly's intuitive interface and WebStar's unique way of mapping URL text strings to physical directories.

SECURING YOUR WEB SERVER

As Web servers move into the intranet and as Internet commerce becomes more prevalent, security will become more important. Web server security seems either too hot or too cold for today's intranets. If you need to restrict access to pages inside the company, you'll have the choice of using unencrypted passwords across the wire, or alternatively, by using SSL, a complex and slow method that encrypts passwords and data.

The most common way to provide security is called *basic authentication.* Restricted pages are protected with user names and passwords. Client TCP/IP addresses or host names can also be used to restrict access.

User or group management can be done by the Web server itself, or the Web server can use the services provided by the operating system. Microsoft IIS, Commerce Builder Pro, and Purveyor Encrypt WebServer can all use the access control provided with the underlying NOS in some way. NetWare Web Server is fully integrated with NetWare Directory Services (NDS), Novell's global directory service. Although it is convenient to have one place to manage users, it is a potential security risk. Passwords go across the wire unencrypted; if they are snooped, it might compromise not only your Web server but the security of your entire network operating system.

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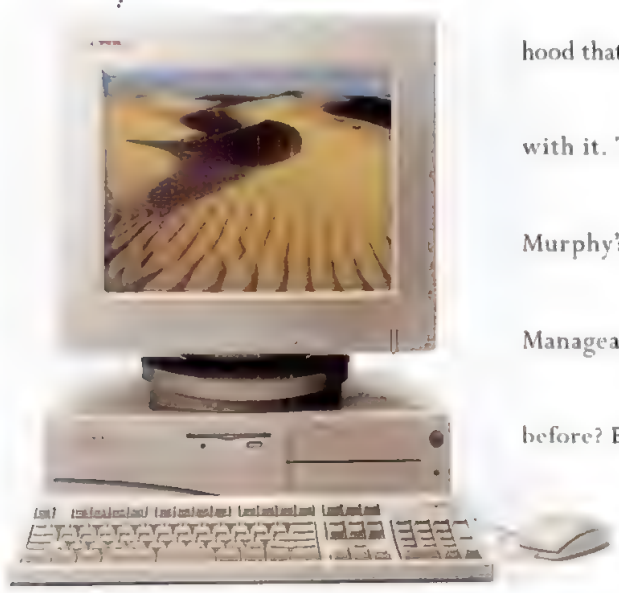

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If basic authentication does not provide the level of security you need, you might want to enable *Secure Sockets Layer (SSL).* Developed by Netscape, SSL 2.0 provides a secure connection between clients and servers using data encryption. Other benefits of SSL are guaranteed message integrity and server identity authentication. Currently, to use SSL, you must pay for and obtain a server certificate from a certificate authority like VeriSign. This makes sense for Internet sites needing to authenticate themselves, but for intranet purposes, this process is overkill. In the near future, we expect to see products that provide ways of issuing internal certificates. Netscape has announced a product called Certificate Server due out by year-end. In our evaluation, both the Apache and IBM products were able to generate their own certificates.

All of the Web servers reviewed here except the product from Novell had SSL 2.0. With the newest version of SSL, Version 3.0, Netscape has cleaned up the SSL specification and added client identity authentication. With SSL 3.0, servers now have a way to authenticate the identity of a client trying to access its resources. Currently only Netscape Enterprise Server includes full SSL 3.0 support.

BUILDING THE APPLICATIONS

One of the most important parts of the Web server is the most difficult part to see. The application development environment and database connectivity tools are critical for extending the Web server. These features are not easy to evaluate since they deal with abstract and detailed APIs, the idiosyncrasies of scripting languages, and the preferences of programmers. We catalog the different options offered by the products and set forth some of the advantages and disadvantages in our sidebar (see "Linking Web Servers with Live Data").

FAST ENOUGH

We found that these Web servers performed very nicely overall, and each had something special to offer. Read on to discover their subtle differences.

The Internet Factory Inc.

Commerce Builder Pro

While Commerce Builder Pro ($995 list price) has attractive features such as virtual servers, an extensible macro language, a Chat Room feature, and a Proxy Server, we found that configuring the system is not as straightforward as it is with O'Reilly & Associates' WebSite Professional or Microsoft Corp.'s Internet Information Server. Still, with its better-than-average performance, Commerce Builder Pro makes a suitable choice for all but the busiest Web sites.

Commerce Builder Pro can run as an application in Windows 95 or Windows NT or as a service in Windows NT. For either platform, you administer Commerce Builder Pro through a Control Panel applet. This utility is very flexible: It lets you set configuration parameters at the global level (that is, for the entire system of Commerce Builder Pro servers), class level (all servers of the same type, such as all Proxy servers), and local level (an individual server).

Configuration was confusing, however. For example, the manual describes "Class" settings, but the corresponding utility window is entitled "Global Settings." In addition, Commerce Builder Pro provides you with no context-sensitive help: The package includes a help file, but you must know where it is and launch it separately, because you won't see a Help button anywhere in the administra-

WEB SERVERS

How to Read the Suitability to Task Boxes

You'll find most of the products in this roundup install quickly and easily if you are familiar with the operating system on which they run. For **setup and configuration,** we gave high ratings to products with clear documentation and scripted or wizard-like setup routines. We preferred products that walk the user through configuring virtual servers, IP address assignments, and proxy servers. Configuration done through a Web browser is a favorable feature for those considering servers on multiple operating system platforms.

SUITABILITY TO TASK

Product name	
Setup and configuration	Poor
Server management, administration, and access control	Fair
SSL security	Good
Content and site management	Excellent

Server management and administration encompasses everything a Web administrator has to do to keep the Web server functioning correctly. We looked for an intuitive management interface and robust access control based on user names and passwords. Typically we preferred access control that was tightly integrated with the operating system but found that in some cases separate user databases offer advantages for Internet applications (as opposed to intranets). We gave high grades to products that had simple and intuitive interfaces for mapping logical URLs to physical directories. Better products offered remote management through client utilities or Web browsers. We also evaluated common format logging tools.

For **SSL implementation,** we looked at how well the software guides the user through an often cryptic process. Server information must be very specific and accurate for VeriSign to assign the certificates. We liked products that made it clear what information was being requested and gave clear guidelines for fields such as "Organizational Unit." We appreciated setup wizards for generating private key pairs and installing certificates. While we were most interested in SSL 2.0, we took into account support for additional security schemes including SSL 3.0, Challenge Response, Digest, or S-HTTP.

Content and site management are at least as important as basic server administration. HTML page links can be problematic and must be managed carefully. For the site management utilities included with Web server products, we graded how well internal and external hyperlinks could be managed or maintained on either the Web server or other external sites. We took into account how well the utilities worked with various file types or pages and repaired links. We also looked at features for automatically updating links when documents were moved. Products that offered flexible directory indexing with both basic and advanced information received higher scores. We also investigated tools for converting word processing and other files to HTML.

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Linking Web Servers with Live Data

By David S. Linthicum

The tremendous growth of the World Wide Web, in both Internet and intranet environments, has led to innovative techniques for extending the capabilities of Web servers. Using custom scripts and programs, Web developers can allow users who run browsers to link into corporate data, display real-time financial information, place orders, and perform any number of functions that Web servers by themselves normally can't do. In other words, these products allow Web servers to produce dynamic data as well as static text and graphics. "Web Development Tools," in this issue, has detailed reviews and information on these products.

There are three ways to enable Web servers to provide dynamic data: Server Side Includes (SSI), Common Gateway Interface (CGI), and application programming interface (API). Java is in the database dynamic data mix as well. However, Java runs disconnected from the Web server. Each approach is very different from the others, and each has its own strengths and weaknesses.

HOW THEY WORK

If you've seen a counter on a Web page that says, "You are visitor number 234," you've seen the power of SSI. SSI is an easy way to have the Web server insert small amounts of dynamic data directly into an HTML document. In fact, no programming background is required for using SSI. SSI can dynamically include one file within another, as well as execute a program (such as a CGI script) and echo back information such as the host name of the browser or Web server.

SSI, however, is not as well suited as CGI or APIs are for sending and receiving database information from and to the browser. This is because SSI doesn't provide the rich programming capability or advanced API-level access to external resources such as database servers that the other techniques offer. Also, SSI requires a fair amount of system CPU and memory overhead because the Web server has to scan through an entire HTML document to find SSI markers and take the appropriate action.

CGI is a specification allowing Web servers to run external applications that generate HTML documents and send them back to the browser. CGI programs can interact with the browser user, accept data, and even communicate with an external resource server such as a database server through a database API. Developers can write CGI scripts in almost any language native to the Web server, including the popular Perl language, C, C++, Basic, REXX, Pascal, or Windows CGI.

Windows CGI (also known as Win CGI) brings CGI access to Windows 95– and Windows NT–based rapid application development tools such as Microsoft's Visual Basic and Borland's Delphi. Windows CGI is able to provide a spooled exchange of data between the server and the CGI program.

CGI is highly flexible, requires less system overhead than SSI, and is supported by just about every available Web server. But CGI applications are notorious for poor performance. In fact, it's probably not wise to use several CGI applications at a single Web site.

Several Web server vendors have responded to the CGI performance problem by developing proprietary APIs. An API is native code residing on the Web server that, like CGI, extends the Web server's capabilities. APIs allow Web developers to do anything that CGI can do and can be further customized to meet particular Web-borne application requirements.

APIs are native and proprietary; they are created from the ground up to provide the best performance for their native Web servers. ISAPI, for example, is able to improve performance fivefold over CGI. And APIs use the fewest system resources of the three methods discussed here. The catch: Developing for APIs is considerably more difficult than developing CGI applications, if you are coding manually.

API development requires specialized programming techniques like multithreading, process synchronization, direct protocol programming, and error handing. There are several flavors of API, including Microsoft's ISAPI, Netscape's NSAPI, and O'Reilly's WSAPI.

ISAPI, the native API for Microsoft's IIS and Process Software's Purveyor, allows developers to build interactive applications. ISAPI is able to provide better performance than CGI since ISAPI applications are DLLs that are loaded into the same address space as the Web server. Resources are therefore available to all HTTP server processes, and there is less overhead than when calling out to an external CGI script.

Like ISAPI, NSAPI provides Web developers with the ability to customize the base services of the Netscape Web server. NSAPI gives developers the ability to build interfaces with the Web server and external resources such as

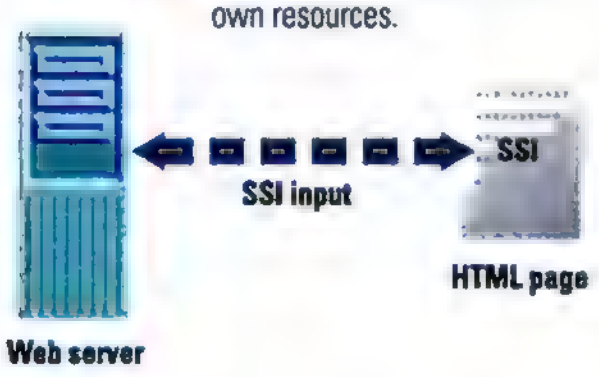
Common Gateway Interface

A CGI script is a specially written process that runs in its own memory space and contends for processing resources.

Application Programming Interfaces

Proprietary APIs provide tight links to special features and processes. Each process, however, is unique to a particular Web server.

Server Side Includes
The Web server scans the HTML page for SSI elements. When it finds an element, the server inserts dynamic information from its own resources.



database servers.

WSAPI is native to O'Reilly's WebSite Web server, providing a set of tools for dynamic Web application development as well as interfaces with back-end resources. In addition to its own proprietary features, WSAPI is able to run ISAPI through an ISAPI-compatibility mode.

While developing for APIs is potentially difficult, both Netscape's and Microsoft's Web server products include easy-to-use scripting capabilities that run on top of the API. Netscape Enterprise Server comes with LiveWire, and Netscape FastTrack Server offers LiveWire as an option. Microsoft's Internet Information Server provides the Internet Database Connector (IDC)—an application running on ISAPI. Many third-party tools are also available for linking Web servers to databases, as discussed in "Web Database Tools" in this issue.

Finally, Java is also able to provide database connectivity, but it does so in a way different from CGI, SSI, or API. Instead of connecting to a process or an API from the Web server, users download Java applets embedded in HTML documents for local execution inside of a Java-enabled browser. The running applet is able to link back to a database server existing anywhere on the Internet or intranet.

Using Java usually removes the Web server from the equation entirely. However, some Web servers, including Netscape's, come with an integrated Java interpreter. When an incoming request points to a Java application, the server passes the request to the Java interpreter, which executes the application on the server.

Java applets are able to connect to database servers using native database APIs from the database vendors, or by using JDBC (Java Database Connectivity), a common API layer that's functionally equivalent to Microsoft's ODBC (Open Database Connectivity).

Java
Java and similar browser add-ins transport a small application to the client computer. This technique reduces the workload on the Web server.

THE REAL WORLD

We wanted to get a feel for how difficult it is to create Web server-to-database connections using the tools provided by the Web server, so we asked Microsoft and Netscape to each come in and build a specific application. We provided a Web server and whatever database the vendor preferred. And we allowed each vendor to choose the database connection device. Netscape chose to use LiveWire with Netscape Enterprise server and to connect to an Informix online workgroup server. Microsoft used the IDC that comes with Internet Information Server to connect to Microsoft SQL Server.

Once the software was installed, each vendor built a simple employee lookup application. The application had to add an employee to a database, retrieve data about an employee, and edit employee information (for example, change a salary).

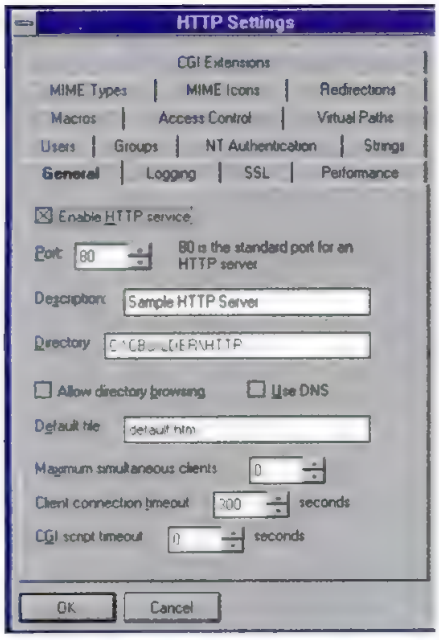
We found that the Microsoft product had the more simplistic approach. There is no programming language to speak of. Instead, Microsoft developers using IDC are limited to templates and descriptor files. The Web server receives a URL, which is parsed by IDC. The IDC process then loads one of a number of stored scripts that define and invoke communications with an ODBC layer. The ODBC layer in turn communicates with a database. Information returning from the database is converted into HTML pages using template files for delivery back to the user running a Web browser. Microsoft plans to ship a new language code-named Denali during the summer of 1996. Microsoft claims that Denali is functionally equivalent to LiveWire.

Netscape's LiveWire uses JavaScript to provide a complete development environment with object frameworks and client-side persistence. As with the Microsoft example, the Netscape server parses the incoming URL, finding the requests for LiveWire. The interaction with the database happens from within JavaScript code using a method called *database connection* inside of a database object.

JavaScript retrieves database answer sets using a "cursor." A cursor is a pointer to rows in an answer set, which is the information sent back from the database server. The JavaScript application simply reads each row from the cursor, converting it to HTML using JavaScript.

The Microsoft solution is well suited primarily to simple database queries and requires less expertise than LiveWire. However, unlike LiveWire, which maintains a connection with the database throughout each session, IDC opens and closes a connection with each incoming request. This can slow down performance.

We preferred Netscape's LiveWire because of its full-featured development capabilities, but it requires more programming expertise than Microsoft's IDC, and LiveWire's development environment is completely text based. Your selection of the Microsoft or Netscape software or some other solution will depend on the needs of your particular application and your level of programming knowledge.



Commerce Builder Pro's management utility was sometimes confusing to use.

SUITABILITY TO TASK

Commerce Builder Pro

Setup and configuration	Good
Server management, administration, and access control	Good
SSL security	Good
Content and site management	Good

tion utility. The Internet Factory says it is correcting these problems in a new version of the product, called Merchant Builder, which should be available by the time you read this.

With Commerce Builder Pro, you can set up user and group accounts, with which you can customize access to specific parts of the system. You can create access control filters that restrict the functions (such as get or post) that specific users may use for a specific IP address on the server. You can also restrict access by domain, IP range, and individual page. And if you don't want to reenter every user and group on your system, Commerce Builder Pro allows you to access the user database in Windows NT Server, an option that is very useful for intranet deployment. Only Microsoft Internet Information Server and Process Software's Purveyor provided similar integration with the Windows NT Server user database. In addition, Commerce Builder Pro supports SSL 2.0, which authenticates server identity and encrypts data between clients and the server.

The Internet Factory also offers a product called Communications Builder Pro, which is identical to Commerce Builder Pro except for its lack of SSL support.

Like several other servers we reviewed, Commerce Builder Pro includes a virtual server feature. With Commerce Builder Pro, you can host as many as 16 virtual servers on a single physical system. You can give each of them a different domain name and IP address, or you can assign each virtual server different port numbers with the same IP address. The virtual servers are especially useful for Internet service providers who host Web sites for several different companies. You can also use them in a corporate intranet, assigning different domain names (such as "marketing") to different departments in your company.

Commerce Builder Pro's proprietary macro language, Server Macro Expansion (SMX), lets you connect to any ODBC data source, including FoxPro, Microsoft Access, and Microsoft SQL Server databases. SMX can be used to design server-based applications. The forthcoming Merchant Builder server will include Electronic Store, an application written in SMX that includes order forms, a search engine, and a feature for tracking purchases. Commerce Builder Pro also includes support for CGI.

More than just an HTTP server, Commerce Builder Pro includes a Chat Room feature and Proxy Server. Chat Room, which you set up using Commerce Builder Pro, lets users who connect to the Web site hold a live conversation using only their Web browsers.

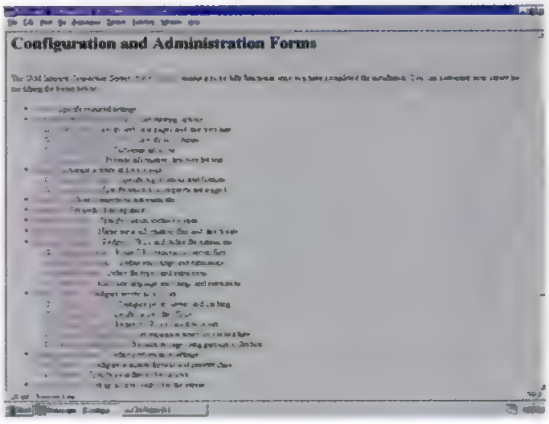
A proxy server can speed access to Web pages by caching frequently used documents on the server; it caches or updates files as clients request them. But unlike other proxy servers, Commerce Builder Pro's does not support batch downloading to your server.—*Eric Harper*

Commerce Builder Pro. List price: $995. The Internet Factory Inc., Pleasanton, CA; 800-229-6020; fax, 510-426-9538; www.aristosoft.com/ifact/inet.htm. *Circle 465 on reader service card.*

IBM Corp.

Internet Connection Secure Server for OS/2 Warp

Despite its good-looking exterior, IBM Corp.'s Internet Connection Secure Server for OS/2 Warp is complex to configure and lacks virtual servers. Its performance was well below average, especially at higher client loads. The real value of Secure Server ($1,199 list price) is that it's one of the few OS/2-based Web servers available and includes a unique CICS and DB2 gateway. Secure Server also includes a proxy server, though it does not include site-management tools or a search engine.



As with Netscape servers, you can configure IBM's Internet Connection Secure Server through a Web browser.

SUITABILITY TO TASK

Internet Connection Secure Server for OS/2 Warp

Setup and configuration	Good
Server management, administration, and access control	Fair
SSL security	Good
Content and site management	Fair

We installed the product on OS/2 Warp Server, Version 4, using the OS/2 High Performance File System (HPFS). If you already have the operating system and TCP/IP stack configured, you can install the Web server in about 5 minutes. Secure Server is also available for Windows NT Server and IBM's AIX; we chose the OS/2 version because it is the only commercial Web server available for the platform. (Freeware servers, including Apache for OS/2, are also available.)

Secure Server does not allow multiple host names on a single server—a feature

known as virtual servers and supported by most products in this roundup. IBM says that Version 4.1 of Secure Server, which should be available by the time you read this, will support virtual servers and will have enhanced performance.

Once the server is installed, its default home page provides an entry into some helpful pages for the Web administrator: a sample Web page, a Web master's resource kit with links to helpful Internet pages, and online documentation. The most important link is to the Configuration and Administration (C&A) forms, the browser-based management interface.

You can configure Secure Server in one of two ways: using the browser interface or manually configuring the HTTPD.CNF file on the Web server. Like the Netscape browser interface, IBM's can be clumsy because there is no real-time interaction with the server. Overall, however, we liked using the forms and the uncluttered configuration list. We especially liked the link in C&A that shows the default settings—useful if you want to start over.

Manually editing the configuration file is not as hard as you might think. The directives are clear, and the server gives samples of each one in the form of comments in the file.

Secure Server supports all of the standard HTTP methods: get, head, and post. The method configuration screen also has radio buttons for put and delete, but we soon learned that they're just for show: You can use them only if you have a CGI executable that performs the necessary operations, but IBM does not include any.

Secure Server has powerful but complicated security and access control. The server includes both SSL 2.0 and Secure HTTP (S-HTTP) for encrypted communications. Like Stronghold: Apache-SSL-US, Secure Server can generate its own SSL certificates, so you don't need to deal with a third-party certificate authority.

Access control can work via user name and password or by filtering on the accessing client's TCP/IP address or domain name. Defining these protections is difficult: When you're setting a specific parameter, it's confusing whether you should set it in the configuration file, refer to another file, or do both. While the access control can be powerful, it's also easy to make a mistake.

Secure Server has several options for content formatting. You can choose default documents, such as WELCOME.HTML or INDEX.HTML, to display when the user doesn't specify a document. Directory listings can describe documents and tell when they were last modified. An access log and an error log record the server's operations, and you can view the access log in real time on the server.

Secure Server's programming environment leaves no doubt that this is an IBM product. Along with standard CGI support, it includes a DB2 and CICS gateway. If these are important to you, this is the product for you.—*Robert P. Lipschutz*

Internet Connection Secure Server for OS/2 Warp. List price: $1,199. IBM Corp., White Plains, NY; 800-426-2255; www.ics.raleigh.ibm.com. *Circle 466 on reader service card.*

Microsoft Corp.

Microsoft Internet Information Server

PC MAGAZINE EDITORS' CHOICE

Microsoft Corp.'s first time at bat in the Web server ball game produced a solid base hit. Microsoft Internet Information Server (IIS) provides excellent setup and Windows NT integration—and you can't beat the price. IIS is available for free from the Microsoft Web site, although you must purchase Windows NT Server ($999 with a 10-user license) to run it. Unlike Netscape, which offers a variety of platforms for its servers, IIS runs on only Windows NT Server. But IIS had very good overall results on our performance tests, with a slight edge over both versions of Netscape's Windows NT servers.

Microsoft intends to ship version 2.0 of IIS as part of the late-summer Windows NT Server 4.0 release. We looked at both versions for this review, but we ran our tests on the 1.0 release. Although the two versions are similar, Microsoft says that IIS 2.0 will be faster than IIS 1.0 on NT 4.0. IIS 2.0 will also add other enhancements, including Web browser–based management and Microsoft FrontPage (reviewed elsewhere in this issue), an HTML authoring and site management tool.

As you would expect, IIS is very tightly integrated with Windows NT Server. The wizard installation is painless, taking only a few minutes. IIS creates a generic user account on the Windows NT server, and this account has read-only rights to the files in the IIS server directory. If you're installing a public Web server with no security restrictions, you can simply place your content files in the appropriate directory, and you're done. We successfully published a set of files in just a few minutes.

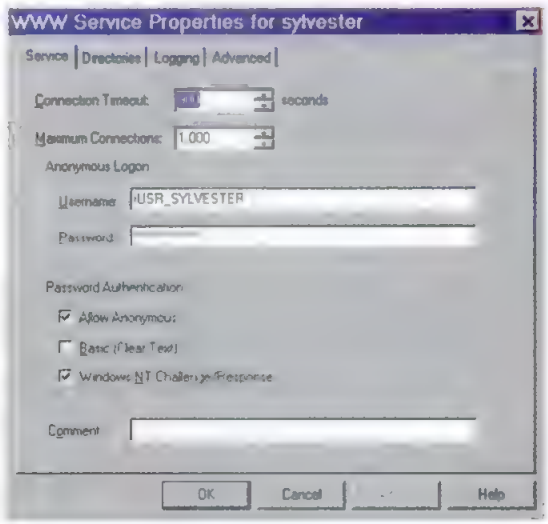
In addition to an HTTP server, IIS includes both an FTP and a Gopher server. By default, the installation wizard sets up all three servers, which run as NT Services. Internet Service Manager, included with IIS—a simple Control Panel–type application—lets you start, stop, and configure each of the three Services. You can use it on any NT-based PC on the LAN to administer any of the servers.

Internet Service Manager allows you to control access, specify server directories, and set logging options. If you're seeking tools for Web server management and for detailed logging and usage reporting, you may be disappointed. IIS produces a user log that you can save as

SUITABILITY TO TASK

Microsoft Internet Information Server

Setup & configuration	Excellent
Server management, administration, and access control	Good
SSL security	Good
Content & site management	Fair



Microsoft IIS's management features are basic but well integrated into the Windows NT architecture.

PERFORMANCE TESTS

Web Server Software

PC MAGAZINE LABS

Microsoft IIS, NetWare Web Server, and the Netscape Enterprise and FastTrack servers running on Intel-based hardware turned in top-notch performance.

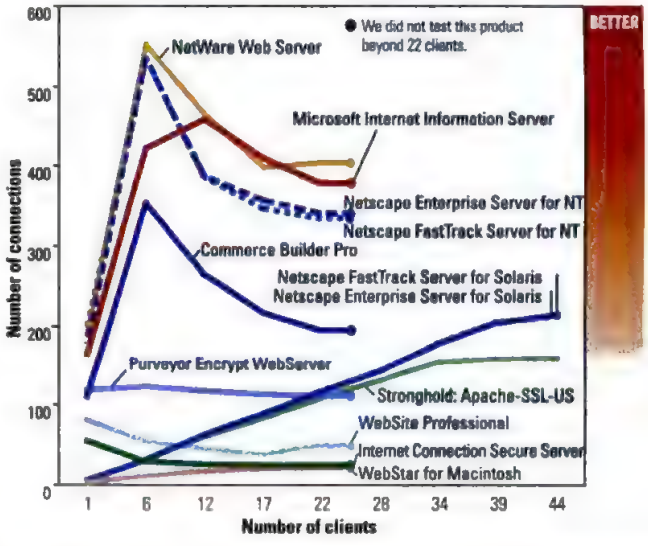
What the Numbers Mean

The mileage you get from your Web server, as with any server-based application, will vary greatly depending on the combination of the Web server, the operating system, and the server hardware you run. You should choose the environment you're most familiar with, because in most real-world scenarios, the speed of your Internet or intranet connection will be more of a bottleneck than the servers themselves. Our performance test results will give you an idea of how the sum of your package's parts will fare when pushed to the breaking point. You should find the performance of any of these products sufficient for regular business traffic unless you plan to serve millions of hits per day.

Using our custom HTTP client, we pummeled each server with requests to demand pages as fast as the server could provide them. One of our test clients caused as much server activity as many real clients might. By using a 100-Mbps Fast Ethernet network, we removed connection limitations such as modem or other communications links and even found 10-Mbps Ethernet a limiting factor when generating our high-stress loads. Our objective was to determine each server's capability for opening simultaneous connections and the time it took to respond to requests. We found saturation for the best Intel-based products at 6 test clients, while we were only beginning to stress the Web servers on the SPARC platform at 40 clients. So, for each non-Unix platform, we tested only up to 22 clients; for the Unix servers, we increased the load to 44 clients.

Each product's Average Connections per Second scores reflect the rate at which the Web server can accept client connections .Typically, a browser session will open five or more connections to download text and graphics from a Web server. Higher scores indicate that the server is more powerful in its ability to open and tear down multiple simultaneous connections. Lower scores mean that clients will be turned away because the server is busy responding to other requests. We saw high-level performance from NetWare Web Server, Microsoft IIS, Netscape Enterprise Server, and Netscape FastTrack Server: At peak performance loads of 6 and 12 HTTP test clients,

AVERAGE CONNECTIONS PER SECOND

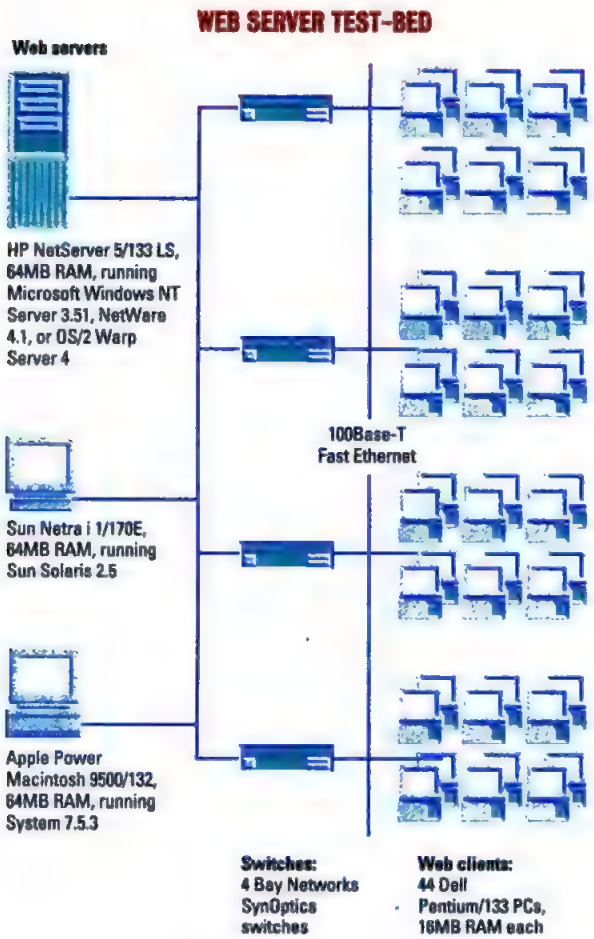


AVERAGE RESPONSE TIME

Milliseconds
Lower scores represent better performance.

	1 client	6 clients	12 clients	17 clients	22 clients	28 clients	34 clients	39 clients	44 clients
Commerce Builder Pro	9.2	17.1	45.5	78.7	113.5	N/A	N/A	N/A	N/A
Internet Connection Secure Server	18.6	209.8	471.0	684.1	894.6	N/A	N/A	N/A	N/A
Microsoft Internet Information Server	6.1	14.2	26.2	41.8	58.4	N/A	N/A	N/A	N/A
Netscape Enterprise Server for NT	5.7	11.2	31.1	47.8	64.9	N/A	N/A	N/A	N/A
Netscape Enterprise Server for Solaris	198.7	199.7	195.4	192.1	190.6	187.9	187.1	189.4	207.9
Netscape FastTrack Server for NT	5.1	11.2	31.2	49.3	66.0	N/A	N/A	N/A	N/A
Netscape FastTrack Server for Solaris	195.1	195.4	196.1	193.5	191.8	189.0	187.9	190.6	208.0
NetWare Web Server	5.3	10.9	25.8	42.8	54.7	N/A	N/A	N/A	N/A
Purveyor Encrypt WebServer	8.6	49.8	104.5	153.4	201.4	N/A	N/A	N/A	N/A
Stronghold: Apache-SSL-US	197.7	200.8	202.8	205.7	204.5	205.3	217.5	246.5	278.1
WebSite Professional	12.6	111.8	272.5	453.6	455.6	N/A	N/A	N/A	N/A
WebStar for Macintosh	371.3	561.5	728.2	859.9	1,022.2	N/A	N/A	N/A	N/A

N/A—Not applicable: We did not test this product beyond 22 clients.



these servers delivered in the range of 450 to 550 connections per second. These numbers give you an idea of a Web server's capacity for *hits per day*, a commonly used measure of a Web site's activity. For example, 500 connections per second translates to more than 43 million hits per day, far greater than any Web site experiences today.

The Average Response Time indicates the total time the Web server takes to complete a client browser's request for a page. This calculation is inversely proportional to connections per second, as smaller response times will allow more connections. We were initially surprised to find what seemed to be poor response and connection times for the Unix-based Stronghold and Netscape's Unix servers. When we analyzed CPU utilization, however, we found our test was not saturating the Web server. We found these products quite scalable compared with the Intel-based products as we continued to add clients to the 44-client test-bed limit. From this point we began to see the UltraSPARC processor used to its capacity, resulting in better performance from the Netscape products. Additional clients would have been required to find peak performance.

Commerce Builder Pro offered middle-of-the-pack performance, and Purveyor Encrypt WebServer lagged considerably behind NetWare Web Server and the top-performing Windows NT servers. But Commerce Builder and Purveyor easily outpaced the substantially slower WebSite Professional, Internet Connection Secure Server for OS/2 Warp, and WebStar for Macintosh—each of which performed less effectively on our tests. WebSite Professional and Internet Connection Secure Server do not provide dynamic caching for data requests, which greatly enhances performance. Both go to the disk subsystem to satisfy page requests, a performance trade-off that allows Web administrators to update content without stopping the server or turning off caching. (Netscape, however, claims that its caching implementation will allow updating pages on the fly.) WebStar's performance probably was limited by its operating-system cache limit and lack of preemptive multitasking.

When reviewing our performance test scores, keep in mind that they reflect our specific test-bed and conditions and are not comparable to the results of other benchmark tests that use different data types, test-beds, and client types. Our tests do not reflect interactive tasks, such as CGI, that you may have on your server. We also did not test additional performance enhancements such as browser caching, because we wanted to stress the servers as much as possible. The HTTP keepalive parameter, which allows multiple documents to be accessed with one connection, was not implemented, though it is available for many of these products.—*Analysis written by Jeffrey G. Witt*

How We Tested

For our Web server performance tests across five different operating systems, we developed a test suite that uses an HTTP 1.0–compliant client, a scheduler control station, and a test-load file set.

We first loaded the HTTP client software on 44 Dell Pentium/133 PCs running Microsoft Windows NT Workstation 3.51. The client performed get requests from our server and recorded the Web server's **Average Connections per Second** and **Average Response Time.** Because the test works independently of the server platform, we measured all the results at each client. The test scheduler launched the clients incrementally to add workloads to the server and to gather the results of each test run. We used the HP NetServer 5/133 LS for all Intel-based Web servers, the Sun Netra i 1/170E for those that ran on Sun's Solaris, and the Power Macintosh 9500/132 for the Apple product. For Web servers that ran on Windows NT Server 3.51, NetWare 4.1, Macintosh System 7.5.3, and OS/2 Warp Server 4, we staged loads from 1 client and then increased the number in batches of 5 or 6 clients up to 22 clients. We tested Web servers that ran on Solaris 2.5 in the same manner up to 44 clients.

The 5MB test-load file set consisted of 500 plain-text HTML files of various sizes, with an average file size of 10K. We made sure the total test-load size fit comfortably within each server's memory cache to avoid testing the I/O system on the server.

We tested all Web servers using the TCP/IP protocol stack provided with the server operating system. Each test client used the TCP/IP stack included with Windows NT Workstation. When possible, we disabled the Web server's security and logging functions and applied vendor-recommended tuning, patches, or fixes for the product's native operating system.

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CIRCLE 379 ON READER SERVICE CARD

a text file or write directly to an ODBC database, but the server lacks the sophisticated statistical reports provided by Netscape Enterprise Server.

IIS provides good security that is well integrated with Windows NT. You can set up IIS to require a user name and password for accessing the Web server or any pages or directories on the server. You can also allow or deny access based on IP address ranges or specific IP addresses. IIS uses Windows NT's user database, which means you can manage your Web user list with the same tools you use for your NT server users. This eliminates the need to keep a separate database of Web server users.

For users with more advanced security needs, IIS supports SSL 2.0 security. You can have a mix of SSL and nonencrypted pages on the same server. Microsoft provides an SSL key generator program to simplify the process of obtaining an authentication certificate.

With Internet Service Manager, you can give different IP addresses to specific directories on the NT server. This feature allows you to set up several virtual servers on a single physical server. The virtual Web sites appear to users to be running on separate computers, and each of the Web servers can have a unique host and/or domain name. This feature, provided by several other Web servers that we reviewed, should appeal to Internet service providers and any organization that needs to host multiple servers on a single machine.

No Microsoft server product would be complete without a truckload of programming interfaces, and IIS is no exception. It supports not only CGI and Perl scripts for simple application development, but also the Internet Server API (ISAPI), a heavy-duty API developed by Microsoft and Process Software that lets programmers create complex Web applications. Support for Java is conspicuously absent: Microsoft would prefer that you use Visual Basic for writing Web applets.

Microsoft also provides Internet Database Connector, an ISAPI-based application that offers hooks into Microsoft Access, Microsoft SQL Server, Oracle, Sybase, Informix, and other ODBC-compliant databases (see "Linking Web Servers With Live Data"). IIS doesn't come with any tools for creating or managing content, but the server works well with Microsoft FrontPage.—*Les Freed*

Microsoft Internet Information Server. List price: Free. Microsoft Corp., Redmond, WA; 800-426-9400; fax, 206-936-7329; www.microsoft.com. *Circle 467 on reader service card.*

Netscape Communications Corp.

Netscape Enterprise Server
Netscape FastTrack Server

PC MAGAZINE EDITORS' CHOICE

Netscape Communication Corp.'s new Netscape FastTrack Server and Netscape Enterprise Server are replacements for the company's top-selling Communications Server and Commerce Server. Targeted at the mainstream server market, FastTrack is designed to get your Web site up and running quickly. O'Reilly & Associates' WebSite Professional, Microsoft Internet Information Server, and Process Software Corp.'s Purveyor Encrypt WebServer were a little easier to use, but sophisticated access control, SSL 3.0 support, and top-notch performance make FastTrack a great deal at $295 (list price)—even when compared with Microsoft IIS, which is free and will be part of Windows NT Server 4.0.

Netscape Enterprise Server ($995 list) builds on FastTrack's solid foundation. The Enterprise Server includes additional features for large enterprises in which several persons or departments share page creation and management responsibilities. These features include additional monitoring capabilities; client-side certificate authentication; an integrated search engine from Verity; Simple Network Management Protocol (SNMP) support; Web site content management via Netscape's LiveWire; and document check-in, check-out, and version control.

Both products are available for Windows NT and a smorgasbord of Unix varieties, including HP-UX, IBM's AIX, SGI Irix, and Sun Solaris. All of the Netscape servers also come with Netscape Navigator Gold 2.0 and support for HTTP 1.1 put, letting HTML authors view an existing page, make changes, and save the page back on the server with just the click of a button.

Both products support Java and JavaScript as well as the Netscape Server API (NSAPI), which lets developers create custom applications that can respond to HTTP requests with live information.

We tested each server's Windows NT Server and Solaris versions. (Netscape was in the final stages of beta testing Enterprise Server as we went to press.) Performance for both Enterprise and FastTrack under Windows NT was excellent; their results were similar to those of Microsoft Internet Information Server and Novell's NetWare Web Server.

Netscape Enterprise Server's Web browser configuration interface was occasionally awkward and confusing.

SUITABILITY TO TASK

Netscape Enterprise Server

Setup and configuration	Good
Server management, administration, and access control	Good
SSL security	Excellent
Content and site management	Excellent

SUITABILITY TO TASK

Netscape FastTrack Server

Setup and configuration	Excellent
Server management, administration, and access control	Good
SSL security	Good
Content and site management	Fair

Initial results were not nearly as impressive for the Solaris-based products at lower client loads. But we found that the Unix-based servers running on our Sun Netra test machine were much more scalable than their Intel-based brethren. The Netscape servers on Solaris were able to sustain increasingly good performance even up to a load of 44 clients, whereas the Intel-based Netscape servers tapered off after hitting their peak performance at 6 and 12 clients.

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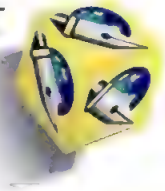

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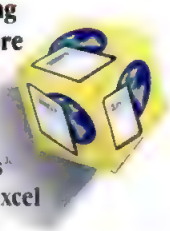

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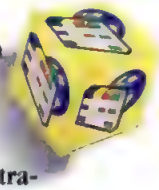

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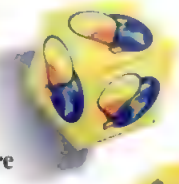

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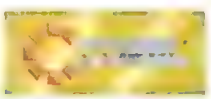

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CIRCLE 011 ON READER SERVICE CARD

FAST AND EASY

Installing both packages was easy. For each of the Windows NT–based servers, we clicked on a single executable file, which launched a simple installation program; after asking a few basic questions, it automatically brought up our Web server. In the case of each Solaris-based product, we uncompressed a single file, which unarchived a setup program and some other files. The setup program asked us a few questions, and we were up and running.

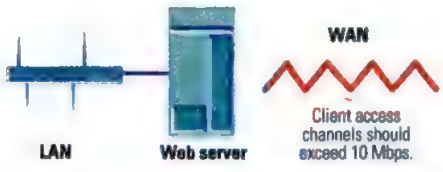
Once you have installed the package, Web server configuration is the same regardless of platform: You configure both FastTrack and Enterprise Server from a Netscape Navigator Web browser using the Netscape Server Manager (NSM) administration program. As a result, you don't need to deal with the details of configuring a particular operating system, and you can manage all of your Web servers remotely: You just need to know the administration screen's URL and password for the Web server you want to manage.

We found some problems with the Web browser approach, however. Although the administration utility uses a number of advanced Navigator features, such as Netscape frames and JavaScript, the user interface is still a bit awkward—especially when compared with a product such as O'Reilly's WebSite, which uses a standard Windows interface. For example, creating users and groups is easy, but limiting access to directories can be slow and difficult. Also, neither product integrates into Windows NT's or Solaris's user and group information, so if you're using either server internally, you must maintain separate user and password lists.

Otherwise, Netscape Server Manager gives you extensive control over your Web server configuration. NSM lets you set up virtual servers, which allow you to map home pages to separate domains on a single server. Unique among the products we reviewed, NSM lets you create common document footers for your Web pages. You can also tune your Web server to control the number of processes and threads handling incoming requests. You can block or grant access to the server or individual pages based on IP addresses or host computer name, and you can assign users read-only or read/write rights for specific directories.

What's Bottlenecking Your Server?

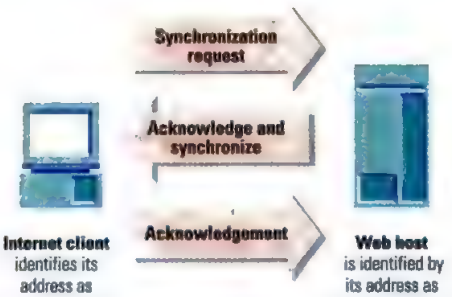
Where do things slow down in your Web server? The way to answer this question is to look at all the functions the Web server is performing, because these functions usually follow one another, and the effects of a delay are cumulative.

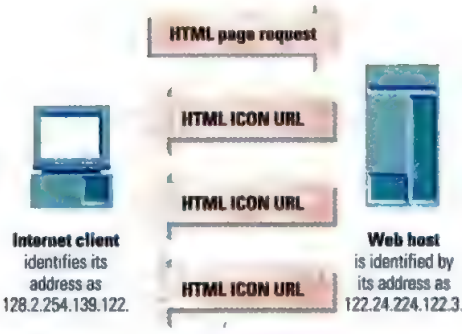


Start with the **connection system.** One modestly equipped Web server can saturate a 10-Mbps Ethernet connection. Make sure you have at least that much bandwidth in the form of LAN connections, multiple ISDN lines, leased-line digital services, or other connection types.

The next potential bottleneck is the **communications process.** The overhead involved in managing a TCP session can result in a long wait.

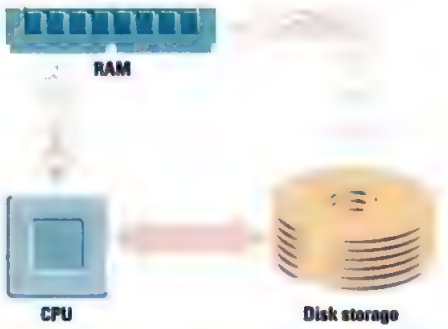
A transaction-control block (TCB) is system memory dedicated to a TCP session. TCBs usually stay dedicated to a particular session for several minutes after the session closes. You can speed up your server by increasing the number of TCBs allowed, adding memory to accommodate the extra TCBs, or regulating the server's discrimination of identical requests coming from the same browser.





TCP carries requests for service coded according to the HTTP format, and there are **tuning tricks for HTTP,** too. A single HTTP request can kick off multiple transmissions from a Web server if the page uses many separate objects. For busy servers, it may be necessary to increase limits on the number of simultaneous HTTP actions, to expand memory available for this increase, and to limit the elements in Web pages. Each object on a page requires more HTTP and TCP actions and raises the likelihood of queued-up requests and delays.

Now it's time to look **inside the computer** for bottlenecks. You should start with at least twice the RAM that you would consider adequate for a file server that is not running client/server processes. It's typically easier to monitor processor utilization than memory utilization. Hitting 85 to 100 percent CPU utilization too often is a sign that you need more processors or less complex Web pages. Applications written for the Common Gateway Interface (CGI), in particular, can burn CPU cycles.



If all the above measures fail, the disk subsystem is typically the final server bottleneck—although a slow disk system can make the CPU look slow, and too little memory can overload a disk system. In a production Web server you should count on using multiple controllers, with multiple drives on each controller.

Turnkey Web Server Solutions

Turnkey Web server products provide both hardware and software in a single bundle for easy installation and management. We cite a price range for each bundle. The actual price depends on the specific hardware configuration requested.

Company	Product	Microprocessor	Operating system	Server software included	Price range	Web site
Apple Computer Inc.	Apple Internet Server Solution	PowerPC 601/66	MacOS	WebStar	$3,314–$8,209	*www.apple.com*
Compaq Computer Corp.	ProSignia line	Pentium/133	Windows NT Server 3.51, NetWare 4.1, OS/2 Warp Server, UnixWare 3.0, or OpenServer 5.0	Microsoft IIS, Netscape FastTrack Server, or NetWare Web Server	$2,900–$4,000	*www.compaq.com*
	ProLiant line	Pentium Pro/150	Windows NT Server 3.51, NetWare 4.1, OS/2 Warp Server, UnixWare 3.0, or OpenServer 5.0	Microsoft IIS, Netscape FastTrack Server, or NetWare Web Server	$7,200–$12,000	
Dell Computer Corp.	PowerEdge Web Server	Pentium/133	Windows NT Server 3.51	Netscape Commerce Server or Netscape Communications Server	$3,663–$33,580	*www.dell.com*
Digital Equipment Corp.	Easy Web Server	Alpha/166	Digital Unix 4.0 or Windows NT Server 3.51	Netscape Communications Server or Purveyor Encrypt WebServer	$6,495	*www.digital.com*
	Internet AlphaServer	Alpha/166, 233, 266	Digital Unix 4.0	Netscape Communications Server	$8,980–$19,995	
	Web Alpha Server	Alpha/233, 266	Windows NT Server 3.51	Netscape Communications Server	$9,795–$16,450	
Hewlett-Packard Co.	HP 9000 D-Class Web Server	Up to 12 PA-7100LC/75s or PA 7200/100s	HP-UX 10.0	Netscape Commerce Server, Netscape Communications Server, or Open Market Web Server	$2,800–$20,877	*www.hp.com*
IBM Corp.	IBM Internet Powersolution	PowerPC/133	AIX 4.1.4, 4.2	Internet Connection Secure Server for AIX, Netscape FastTrack Server, Netscape SuiteSpot	$10,369	*www.ibm.com*
Intergraph Inc.	InterServe	Pentium/133 or Pentium Pro/150	Windows NT Server 3.51	Microsoft IIS	$7,120–$35,120	*www.intergraph.com*
Pacific Internet	WebCube	Pentium/166	Linux 2.2	Stronghold: Apache-SSL-US	$4,995–$12,995	*www.pacnet.com*
Silicon Graphics Inc.	WebForce Indy	4 MIPS R/5000-150,180	Irix 6.2	Netscape Enterprise Server	$10,995–$25,000	*www.sgi.com*
	WebForce Challenge	Up to 4 MIPS R/4400-200s or 250s or up to 36 MIPS R/1000-195s	Irix 6.2	Netscape Enterprise Server	$7,900–$138,000	*www.sgi.com*
Sun Microsystems Inc.	Netra Internet Server	UltraSPARC/110–167	Solaris 2.5	Netscape Enterprise Server	$7,496–$24,395	*www.sun.com*
Zenith Data Systems Corp.	Z-Server MX Internet Information Server	Up to 4 Pentium/100s	Windows NT Server 3.51	Microsoft IIS	$9,399–$16,312	*www.zds.com*

FastTrack can work with third-party certificate authorities (such as VeriSign) to generate server-side certificates. In testing, it was very easy to set up a secure FastTrack server. We created a server public key/private key using the provided key generation utility; then we filled out a simple form (using the Netscape Navigator browser) to generate a site certificate request, which we sent to VeriSign for approval.

Enterprise Server adds authentication support for client-side certificates, which lets clients with appropriate public key certificates log onto several servers without needing to enter user names and passwords for each server. At the time of our review, however, the only Web browser with client-side certificate capability was Netscape Navigator 3.0, which was in beta.

FastTrack's logging facilities are adequate. The server creates standard access logs and error logs as separate files. You can also view these logs' contents from within the administration program using Navigator, an especially convenient feature. But unlike products such as WebSite, FastTrack does not let you log events such as CGI execution, HTTP header fields, or network I/O.

In the case of Enterprise Server, however, you can log CGI events and other activity using extended customizable logging, a language that you can program to log just about any type of transaction.

If you're planning to develop applications using your Web server, you'll appreciate the application environment that comes with both products. In addition to allowing standard CGI scripting (and WinCGI under Windows NT), FastTrack and Enterprise Server let C programmers write directly to the Netscape Server API. In addition, both can run Java applications and come with Netscape Navigator Gold, a WYSIWYG HTML page editor combined with the standard Navigator browser.

Enterprise Server includes Netscape

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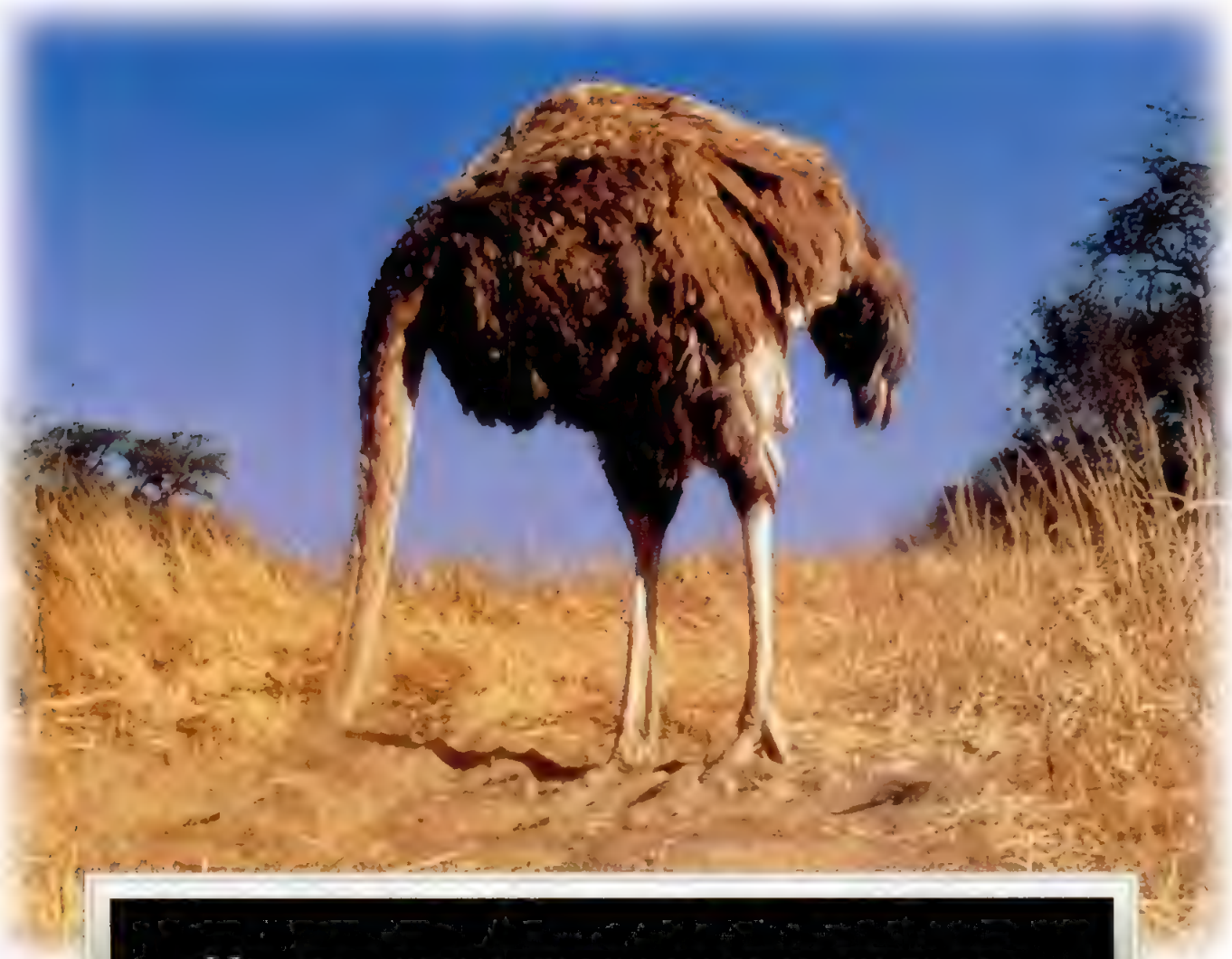

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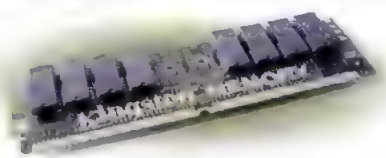

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PC MAGAZINE CIRCLE 106 ON READER SERVICE CARD

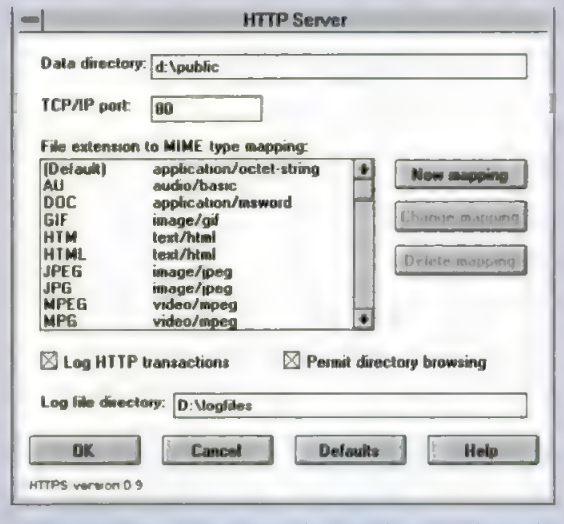
The Freeware Alternatives

By Sean González

Building a presence on the Web entails incurring the costs of acquiring, running, and maintaining a system, and paying an Internet service provider for access to the Internet. Fortunately, you do not have to spend any money on software if you are willing to make some compromises.

Using public domain software often means sacrificing ease of installation and performance. However, we found that the NCSA server for Unix and the EMWAC server for Windows NT Workstation 3.51 or Windows NT Server 3.51 are easy to configure and install. Although they lack some of the advanced features of commercial servers—including proxy server support and encryption—they offer everything you need to build a Web presence.

But building a Web presence extends beyond just running a Web server. You may want to add a search engine, run Web utilization reports, or get notifications if your server goes down. We also include references to must-have tools to keep your Web presence shining.



The EMWAC server lacks many features found in Microsoft IIS, but it's a simple, stable product.

NCSA HTTPD FOR UNIX

NCSA HTTPd is largely responsible for all the hype over the Web. Until the recent release of the Apache server (reviewed in our main roundup), NCSA HTTPd was the server preferred by most Unix users. As with many Web servers, NCSA HTTPd lacks Web proxy server support.

Installing the NCSA server used to mean downloading the software via FTP, unpacking the distribution file, and reading the documentation to figure out how to install and configure the software—which could take a first-time user 2 hours or more.

Although NCSA HTTPd lacks a GUI configuration tool, NCSA recently released its OneStep NCSA HTTPd Downloader to make installation easier. This forms-based tool configures the seven essential configuration parameters required to run NCSA HTTPd on your system. When you submit the configuration form, a personalized copy of the software distribution is created for you. You then download the file, unpack it, and run the server. You can be up and running minutes after you have downloaded the software.

NCSA HTTPd offers full CGI, forms, and image-map support. It also comes with advanced features such as Server Side Includes (SSI), virtual servers, and security access controls. SSI allows you to create intelligent HTML pages (which usually use an .SHTML extension) that display variable information on the fly. For example, using SSI, you can create HTML documents that display the local time.

Multihoming—also called virtual servers—allows you to run multiple Web servers on a single system. Most Unix systems allow you to run multiple IP addresses on a single system, with each IP address configured with its own domain name. For example, a user requesting *www.a.com* will receive a different page from another user requesting *www.b.com*, even though both URLs are served by the same server.

NCSA HTTPd lets you define and maintain a text-based list of users for user-name– and password-protected access to your files. You can also restrict access via IP address, domain name, or host name. Access controls can be imposed on your entire server or on selected files or directory trees. However, although NCSA HTTPd offers good security features and support, as a result of its popularity and some software design problems NCSA HTTPd has fallen prey to hackers' exploits. NCSA's Web server also does not support SSL.

NCSA HTTPd retains its place as an excellent choice to run a Web server under Unix. It is still one of the fastest servers available, and NCSA's continuing support means we can expect that future development will enhance what is already a very good Web server.

NCSA HTTPd for Unix 1.5.1. The National Center for Supercomputing Applications; *hoohoo.ncsa.uiuc.edu.*

EMWAC SERVER FOR WINDOWS NT

The EMWAC HTTP server has evolved into two products: the freeware version and a commercial product called Purveyor Encrypt WebServer, sold by Process Software Corp. and reviewed in our main roundup. Purveyor includes several features that are missing in the freeware EMWAC server: virtual servers, access control, SSL and proxy server support, SSIs, URL redirection, and access logfiles that employ the Common Logfile Format used by most servers today.

The free version of EMWAC's server runs on either Windows NT Server 3.51 or Windows NT Workstation 3.51. Running it on Windows NT Workstation is a less expensive alternative to Microsoft IIS, which, though free, runs only on NT Server. Surprisingly, EMWAC does not come with a GUI setup utility. Despite this shortcoming, installation is simple. All software con-

figuration is done through a Control Panel applet.

We ran EMWAC on Windows NT Server 3.51. By default the EMWAC server runs under the SYSTEM account as a server process. However, this default setup causes problems. Running under the SYSTEM account means that files in your content directory tree must be readable by SYSTEM. Also, running as a server process means that you need to remember to specify the full system and directory path to your content directory if it resides on a file server; otherwise, the content will be available only while the Web administrator is logged on. Fortunately, EMWAC's documentation explains these problems in detail and gives the workarounds as well.

The EMWAC server offers full support for WAIS searches, forms, CGI scripting, and image maps. (To run WAIS searches you will need to obtain the WAIS Toolkit from *ftp://emwac.ed.ac.uk/pub/waistool*.) The EMWAC server is CGI 1.1-compliant and allows execution of any executable or Perl script file. EMWAC includes the two most basic CGI scripts you need to build a forms-based Web application: The first one displays all environment variables in an HTML document, and the second one stores form variables in a text file.

Though the freeware version of EMWAC is missing some desirable features, it's a stable product. You may prefer to install it first, then upgrade to Microsoft Internet Information Server or the Purveyor Encrypt WebServer.

EMWAC Server for Windows NT. European Microsoft Windows NT Academic Centre; *emwac.ed.ac.uk/html/internet_toolchest/https/contents.htm*.

WEB-SITE TOOLS AND SERVICES

Perhaps the three most important things you should be aware of in maintaining a good Web presence are: HTML conformance, server availability, and good server performance. On the Web you can find several free tools and services to keep your Web site healthy.

As HTML evolves and browsers strive to conform to new standards, you should make every attempt possible to build HTML pages that are compatible with the most popular browsers. There are tools and services on the Web that allow you to check your HTML documents automatically. One of these services, WebTechs (*www.Webtechs.com/html-val-svc*), takes URLs as input and delivers to your browser a complete HTML analysis that tells you any errors you've made in your HTML tags. An alternative to WebTechs is the Kinder, Gentler Validator service (*ugWeb.cs.ualberta.ca/~gerald/validate*), which gives HTML analysis results that are easier to interpret.

Few things annoy Web surfers more than reaching sites that are unresponsive or altogether unavailable. Getting an early warning via e-mail or pager that your Web site has become unavailable can save you a lot of frustration and bad reputation. The World Wide Web Consortium (W3C) Line Mode Browser (*www.w3.org/pub/WWW/LineMode*) is a character-based Web browser that retrieves the URL you indicate; if you can successfully retrieve the URL, your server is available. To automate it to send an e-mail or pager message, you'll need to add write a program for use with the browser.

To ensure that your Web site performs at top speed, you should monitor server traffic and take appropriate action once resource utilization reaches saturation points. Routinely analyzing your server's access log will give you an early warning to avoid server slowdowns. You can also use the Unix-based getstats (*www.eit.com/software/getstats/getstats.html*), a popular logfile analysis tool for servers that use the Common Logfile Format. The getstats tool gives you a detailed server-usage report.

For news and reviews of the latest Web tools, visit *PC Magazine's* InternetUser site at *www.internetuser.com*. You might also check the W3C's List of Web Tools at *www.w3.org/pub/WWW/Tools/Overview.html*.

LiveWire (bundled with FastTrack for $495), which extends a Web server's capabilities. With FastTrack and LiveWire, developers can create compiled applications using JavaScript. LiveWire has excellent site management capabilities (which FastTrack lacks), such as the ability to check broken links to external Web sites.

ENTERPRISE CONTENT MANAGEMENT

Enterprise Server is available as part of Netscape's SuiteSpot ($3,995), which bundles it with Netscape's Mail, News, Proxy, and Catalog servers. SuiteSpot also includes Netscape's LiveWire Pro development tool (LiveWire bundled with Informix Online Workgroup Server). Netscape is marketing SuiteSpot as a complete intranet solution. The company

> Netscape Enterprise Server's search and document management capabilities make it a strong solution for the Internet or an enterprise-wide intranet.

plans to integrate threaded discussion capabilities with its Collabra Share and to provide support for the LDAP (Lightweight Directory Access Protocol) directory services standard, in order to position SuiteSpot against Lotus Notes, Microsoft Exchange, and other traditional groupware platforms.

Content management is where Enterprise Server really separates itself from the pack. In organizations in which a number of departments create content, individuals can use Enterprise Server's MKS Integrity Engine to check out and check in HTML documents. By checking out a document, a user prevents others from modifying it until it is checked in. In case that is not enough to prevent chaos, MKS keeps all previous versions of documents on the server. Content creators can view a list of those versions, including the names of the persons who created them, and can even edit a previous version of a document for future use.

The Verity search engine, included

SUMMARY OF FEATURES

Web Servers

PC MAGAZINE EDITORS' CHOICE | PC MAGAZINE EDITORS' CHOICE

■ YES ▱ NO Products listed in alphabetical order	Commerce Builder Pro	Internet Connection Secure Server for OS/2 Warp	Microsoft Internet Information Server	Netscape Enterprise Server	Netscape FastTrack Server	NetWare Web Server	Purveyor Encrypt WebServer
List price	$795	$295	Free	$995	$295	$995	$795
Provides virtual servers	■	▱	■	■	■	▱	■
Automatic URL redirection/Multiple ports	■ ■	■ ■	▱* ▱	■ ■	■ ■	■ ■	■ ■
Can act as proxy server	■	■	▱	▱	▱	▱	■
Built-in search engine	■	▱	▱	■	▱	▱	■
Directory indexing can be shut off	■	■	■	■	■	■	■
SNMP agent included	▱	▱	■	■	▱	▱	▱
Includes HTML authoring tools	■	■	■	■	■	■	■
Includes Web site management tools	■	▱	▱	■	▱	■	■
Image map–builder utility	▱	▱	▱	■	▱	▱	▱
Supports HTTP 1.1 PUT	▱	▱	▱	■	■	■	▱
Configuration and Management							
Web server can be managed from:							
Server console/Network client/Web browser	■ ▱ ■	■ ■ ■	■ ■ ▱	■ ▱ ■	■ ▱ ■	■ ■ ▱	■ ■ ■
Performance utility monitors:							
Current connections/CGI requests	■ ■	■ ■	■ ■	■ ■	■ ▱	■ ▱	■ ■
Files sent/received	■ ■	■ ■	■ ■	■ ■	■ ■	■ ▱	■ ■
Configuration files stored in registry/directory	■ ▱	▱ ■	■ ▱	■ ■	■ ■	▱ ■	■ ▱
Logging							
CERN/NCSA common log format	■	■	▱	■	■	■	■
Logs access/page hits	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Customizable log files	■	■	▱	■	■	■	■
Logs to ODBC/SQL databases	■ ■	▱ ▱	■ ■	■ ■	■ ■	▱ ▱	▱ ▱
CGI scripts can create their own log entries	▱	■	■	■	▱	■	▱*
Log entries identify browser	■	■	▱	■	■	▱	■
Supported Operating Systems							
Windows NT Server 3.51	■	▱	■	■	■	▱	■
Windows NT Workstation 3.51	■	▱	▱	■	■	▱	■
Windows 3.x/Windows 95	▱ ■	▱ ▱	▱ ▱	▱ ▱	▱ ▱	▱ ▱	▱ ■
Solaris	▱	▱	▱	■ (2.4, 2.5)	■ (2.4, 2.5)	▱	▱
SunOS	▱	▱	▱	▱	▱	▱	▱
Irix	▱	▱	▱	▱	▱	▱	▱
NetWare	▱	▱	▱	▱	▱	■ (4.1)	▱
MacOS	▱	▱	▱	▱	▱	▱	▱
OS/2 Warp Connect, OS/2 Warp Server	▱ ▱	■ ■	▱ ▱	▱ ▱	▱ ▱	▱ ▱	▱ ▱
Security							
Password/challenge-response authentication	■ ▱	■ ▱	■ ■	■ ■	■ ■	■ ▱	■ ▱
Supports SSL v.2, SSL v.3	■ ▱	■ ▱	■ ▱	■ ■	■ ■	▱ ▱	■ ▱
Access control handled by OS	■	■	■	▱	▱	■	▱
Separate access control	■	■	▱	■	■	■	■
Access control by domain name/IP address	■ ■	■ ■	▱ ■	■ ■	■ ■	■ ■	■ ■
Can control access to documents/parts of documents	■ ■	■ ■	■ ■	■ ■	■ ■	■ ▱	■ ▱
Creates private certificates	■	■	▱	■	▱	▱	■
Applications Development							
CGI/WinCGI	■ ■	■ ▱	■ ■	■ ■	■ ■	■ ▱	■ ▱
Server-side Java/Server-side JavaScript	▱ ▱	■ ▱	▱ ▱	■ ■	■ ■	■ ■	▱ ▱
ISAPI/NSAPI	■ ▱	▱ ■	■ ▱	▱ ■	▱ ■	▱ ▱	■ ▱
Other APIs	SMX	ICAPI	None	JavaCGI, JavaNSAPI	JavaNSAPI	LCGI, RCGI	None
Allows SSIs (Server Side Includes)	■	■	■	■	■	▱	■
Service and Support							
Toll-free technical support number	▱	■	▱	▱	▱	■	▱
Technical-support hours (eastern time)	11:00–8:00 M–F	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	8:30–7:00 M–F
Online technical support	*www.ifact.com*	*ps.software.ibm.com*	*www.microsoft.com/infoserve*	*www.netscape.com*	*www.netscape.com*	*www.novell.com*	*www process.com*

* The application for this feature must be developed through an API. N/A—Not applicable: The product does not have this feature.

Stronghold: Apache-SSL-US	WebSite Professional	WebStar for Macintosh
$495	$499	$795
■	■	
■■	■■	■■
	■	
■	■	N/A
	■	■
	■	
	■	
■■	■■	■■■
	■■	■■
■	■	■■
■	■	■■
	■	
■■		■■
■	■	■
■		
■	■	■
	■	
	■	
	■	
■ (2.4, 2.5)		
■ (4.1.x)		
■ (5.3)		
		■ (7.01 or later)
■	■	■■
■	■	■
■		■
■	■	■
■■	■■	■■
	■	■
■		
■■	■	■
	■■	
	■	
None	WebSite API	W*API
■	■	
	■	
9:00–5:00 M–F	10:00–8:00 M–F	24 hours, 7 days
www.us.apache-ssl.com	*software.ora.com*	*www.starnine.com*

with Enterprise Server, allows users to conduct full-text searches of a Web site using simple or Boolean queries. It supports both HTML and plain ASCII text documents. You can use the search engine as is, or you can write custom CGI or HTML code to put your own front end on the search engine or to integrate it into any HTML page. An AutoCatalog feature catalogs all of the information on the server, letting users view documents by title, author, last modification time, and popularity. You can schedule AutoCatalog to run at set intervals, providing up-to-the-minute information with no intervention from the Web master.

With its support for client-side certificates and its search and document management capabilities, Enterprise Server makes a powerful solution for the Internet or enterprise-wide intranets. FastTrack is an excellent solution for small to medium-size Web sites that you want to set up quickly.—*John Garris and Les Freed*

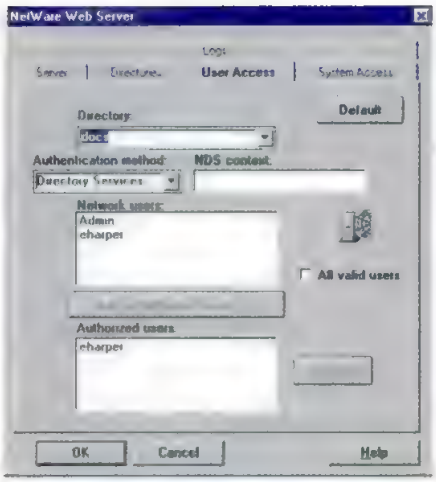
Netscape Enterprise Server. List price: $995. **Netscape FastTrack Server.** List price: $295. Netscape Communications Corp., Mountain View, CA; 415-937-3777; home.netscape.com. *Circle 468 on reader service card.*

Novell Inc.

NetWare Web Server

Novell's NetWare Web Server ($995 list price) might be an appropriate choice for users who have a predominantly NetWare network and want to bring up a solid intranet server. It showed excellent performance on our tests, with slightly better results than the fastest Windows NT Server products. But NetWare Web Server has limited access control features and lacks SSL support, virtual servers, virtual paths, and site management tools, although Novell says that the next revision will have these features. A trial version of the current product is available to download for free, but Novell should perhaps follow Microsoft's lead and give away NetWare Web Server in every red box of NetWare.

NetWare Web Server is a set of NLMs that run on a NetWare 4.*x* server. A runtime version of NetWare 4.1 comes with the product. To run the Web Server, you also must install the TCP/IP NLM, which is included with the runtime version of NetWare.



Apart from its hook to NDS, NetWare Web Server doesn't offer much access control.

SUITABILITY TO TASK NetWare Web Server	
Setup and configuration	Good
Server management, administration, and access control	Fair
SSL security	N/A
Content and site management	Fair

Administration features are very simple. You manage the server with a utility called Web Manager, which NetWare Web Server copies to the Public directory on the server, letting you run it from any Windows PC on the network. An NLM application provides some basic monitoring and report logs, but it's not very detailed.

You set the server's security using the NetWare Directory Services (NDS) database. Through Web Manager, you can grant access to users or groups on a directory basis but not on a file basis; you can also grant access based on IP address or domain name (but not host name). Web Manager doesn't let you exclude specific users or addresses, however. For example, if you wanted to grant rights to all of the users on your network except for one temporary account, you would have to add every possible user to the access control list.

Aside from administration, NetWare Web Server has quite a robust engine. In addition to providing you with standard CGI and Perl script support, this product includes a BASIC interpreter, support for HTML-embedded Java applets and JavaScripts, and Novell's proprietary Local Common Gateway Interface

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Commercial Web Servers

Shown below are some Web server software products that did not meet our SSL compatibility or market-share review criteria.

Company	Product	List price	Phone	Web site	Operating systems	SSL	Non-CGI link to database
American Internet Corp.	SiteBuilder	$1,495	800-425-1112	*www.american.com*	NetWare 4.1	■	■
Beyond Software Inc.	EnterpriseWeb	$6,500	888-923-9663	*www.beyond-software.com*	VM/CMS	■	■
CompuServe Internet Division	Spry Web Server	$495	800-557-9614	*server.spry.com*	Windows NT Server 3.51	■	■
	Spry Safety Web Server	$1,295			Windows NT Server 3.51	■	■
Frontier Technologies Inc.	SuperWeb Server	$795	414-241-4555	*www.frontiertech.com*	Windows NT Server 3.51	■	■
FTP Software	Esplanade Secure	$399	508-685-4000	*www.ftp.com*	Windows NT Server 3.51	■	■
GLACI Inc.	GLACI-HTTPD	$475	414-475-6388	*www.glaci.com*	NetWare 4.1	■	■
	GLACI Secure-Serv	$975			NetWare 4.1	■	■
I/Net Inc.	WebServer400	$1,995	616-344-3017	*www.inetmi.com*	AS/400	■	■
Luckman Interactive Inc.	Web Commander	$99 (Windows 95)	800-711-2676	*www.luckman.com*	Windows 95	■	■
		$299 (Windows NT Server 3.51)			Windows NT Server 3.51	■	■
Open Market Inc.	Open Market Secure Web-Server	$1,495	617-621-9500	*www.openmarket.com*	HP-UX 9.04, 9.05, 10.01, 10.1; IBM AIX 1.4; Irix 5.3; Solaris 2.4, 2.5; Sun OS 4.1*x*; Windows 95; Windows NT Server 3.51	■	■
Oracle Corp.	Oracle Web-Server	$2,495	800-672-2537	*www.oracle.com*	Solaris 2.4, Windows 95, Windows NT Server 3.51	■	■
Peak Technologies Inc.	ExpressO Lite Personal Web Server	$70	360-733-6010	*www.peak-media.inter.net*	MacOS, OS/2, Unix*, Windows 95, Windows NT Server 3.51	■	■
	ExpressO Commercial Web Server	$195			MacOS, OS/2, Unix*, Windows 95, Windows NT Server 3.51	■	■
Questar Microsystems Inc.	WebQuest	$295 (Windows 95)	800-925-2140	*www.questar.com*	Windows 95	■	■
		$495 (Windows NT Server 3.51)			Windows NT Server 3.51	■	■
TEC Solutions Inc.	TECWeb	$10,000	408-973-8855	*www.tecs.com*	HP-UX 10.0, Solaris 2.4	■	■

■ YES ■ NO * This product will run on any machine with Java RunTime.

(LCGI). Whereas standard CGI communicates via TCP/IP sockets, LCGI employs the STREAMS.NLM program. By using LCGI, you can write applications that interact with other NLMs on your server, such as databases. NetWare Web Server includes an NDS browser—which allows any Web browser client to explore NDS objects and properties—that is written using LCGI.

Unfortunately, NetWare Web Server does not provide you with direct connectivity to non-NetWare-based databases. You must either write an LCGI application yourself or wait for the next version of NetWare Web Server, which, Novell promises, will include some kind of database connectivity. The Developer's Guide, which Novell includes with this product, is a good guide to understanding LCGI as well as other development tools that NetWare Web Server supports. Novell provides many examples of applications and scripts created in CGI, Perl, BASIC, and LCGI.

If you are looking for a more complete intranet solution, consider Novell's InnerWeb Publisher ($2,495). This suite includes NetWare Web Server, NetWare Runtime 4.1, a 50-user license for Netscape Navigator 2.01, a 5-user license for SoftQuad's HoTMetaL Light, and Quarterdeck's IWare Lite. We review HoTMetaL, a WYSIWYG HTML editing tool, elsewhere in this issue. IWare Lite is an IPX-to-IP translator that enables access to NetWare Web Server over Novell's IPX protocol. It can be handy if you don't want to set up TCP/IP stacks or assign an IP address for every client. But the product translates only HTTP, S-HTTP, and FTP, and it is not a full gateway: It has no built-in access control or reporting logs.—*EH*

NetWare Web Server. List price: $995. Novell Inc., Orem, UT; 800-638-9273, 801-429-7000; www.novell.com. *Circle 470 on reader service card.*

Process Software Corp.

Purveyor Encrypt WebServer

Purveyor Encrypt WebServer ($795 list) includes just about everything you need to launch a powerful Web site easily. Purveyor comes with an excellent set of content management utilities, Internet Server API (ISAPI) support, built-in proxy server capability, and robust local and remote server management. Purveyor's performance was average or better, but it did not match the performance results of the top tier of Windows NT Server products we reviewed.

To provide a more complete Web site package, Process also sells Purveyor IntraServer for Windows NT ($1,395), which bundles Purveyor Encrypt WebServer with InfoAccess's HTML Transit—an HTML conversion program—and Nomad Development Corp.'s WebDBC database connectivity tool.

Installing Purveyor Encrypt WebServer was a breeze, though swapping the 11 disks made us wish that the product came on a CD. Purveyor installs as a service under Windows NT Server and automatically starts when the server boots up. After it's running, Purveyor lets you create users and groups and carry out other administrative tasks.

The tabbed administration window makes configuring the server easy. From there administrators can easily set virtual paths, launch virtual servers, and configure a proxy server. You can also perform these functions remotely by using a Web browser with Purveyor's Remote Server Management. The HTML pages that you use with Remote Server Management have a tabbed file folder scheme, form fields, and scroll boxes. While the Web browser interface attempts to match the features of the local administration utility, we found the native Windows NT applet easier to use. Also, you must use Windows NT's File Manager to set security for your Web documents.

Purveyor's easy-to-use access control configuration is one of the best that we've seen. Purveyor adds several toolbar buttons and a File Manager menu option that let you set restrictions on directories, files, IP addresses and groups of IP addresses, and virtual paths. Purveyor has a very versatile way of setting security options with a prioritized list of controls, through which you can set complex security measures. Also, like Microsoft IIS and The Internet Factory's Commerce Builder Pro, Purveyor lets you access the Windows NT Server user database so you needn't enter user names and passwords of current users.

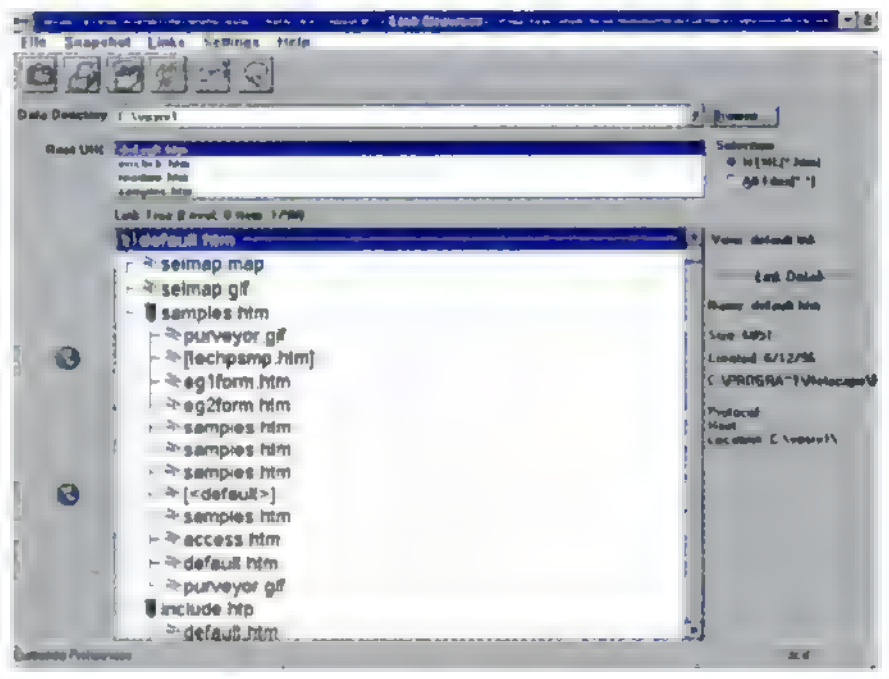
The one shortcoming we came across in the configuration is that Windows NT's File Manager doesn't display the virtual paths you've set up for Purveyor, so you need to remember their exact names.

For managing your Web site's content, Purveyor includes the useful Link Browser utility. It displays your site in a tree structure of linked documents, and it can then automatically find broken URL links to local or external pages. The IntraServer bundle also includes HTML Transit, which converts word processor documents into HTML format. It's not particularly easy to use, and since it's not a WYSIWYG tool, you need to view pages in a browser to see the results.

In addition to CGI, Purveyor supports the Internet Server API (ISAPI), which Process codeveloped with Microsoft. An ISAPI application can process requests more efficiently than a generic CGI script. For basic database access, Purveyor includes a CGI-based program called Data Wizard, which can create two basic types of HTML forms (Add and Find) to access an ODBC-compliant database. Data Wizard includes drivers for several databases, such as Microsoft Access, Microsoft SQL Server, and Oracle7.

The IntraServer bundle includes Nomad Development Corp.'s WebDBC 2.5, a more complete database connectivity tool that can use either CGI or ISAPI. With WebDBC you can create much more complex Web server applications.

Purveyor's flexible logging options are configured through the administration window. Templates let you set up Purveyor to log a variety of parameters; you can create your own template using scripting commands. Log Viewer displays these files in a spreadsheet-like application, making it easy to sort the data. You can also use this tool to graph or chart the data or to export it as comma-delimited text.



Purveyor Encrypt WebServer's Link Browser lets you quickly see whether your URL links are valid.

SUITABILITY TO TASK

Purveyor Encrypt WebServer

Setup and configuration	Excellent
Server management, administration, and access control	Excellent
SSL security	Good
Content and site management	Good

Purveyor's SSL 2.0–compliant Key Management feature walks you through the process of creating key certificate requests, which you must send to a third-party certificate authority. We used key certificates from VeriSign. Once you obtain the keys, you can store them in Key Management's database and then assign keys to virtual servers.—*Andrew Go*

Purveyor Encrypt WebServer. List price: $795. Process Software Corp., Framingham, MA; 800-722-7770; www.process.com. *Circle 471 on reader service card.*

Community ConneXion Inc.

Stronghold: Apache-SSL-US

The Unix-based Web server Stronghold: Apache-SSL-US ($495 list price) is a commercial version of the public-domain Apache Web server. Apache, developed and maintained by a volunteer group of experts from around the world, is the most widely used Web server in all domains and in business Web sites, according to several studies. But the commercial version that we reviewed requires Unix expertise, and technical support for the product is available only

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CIRCLE 368 ON READER SERVICE CARD

File Edit View Go Bookmarks Options Directory Window Help

Back Forward Home Edit Reload Images Open Print Find

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Forrester defines Full Service Intranet as: standardized e-mail, directory, file print, and network management. Netscape gets it. And with SuiteSpot it has begun to deliver on the vision.
–The Forrester Report
The Full Service Intranet, March, 1996

And *PC WEEK* said:

For corporations planning to use internet-based technologies for internal use, [Netscape] SuiteSpot is shaping up as a better alternative...
–*PC WEEK*, May 13, 1996

Netscape's full range of intranet solutions provides greater functionality and costs less to implement than proprietary intranet solutions like Lotus Notes and Microsoft BackOffice. In fact, when Forrester polled professionally managed Web sites, 80% indicated they had chosen Netscape.

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CIRCLE 161 ON READER SERVICE CARD

through e-mail, so users of non-Unix sites or newcomers to the Web will want to think twice before considering Apache.

The free Apache Web server supports almost all Unix platforms as well as OS/2, and its modifiable source code gives you flexibility to customize the server to your own requirements. Community ConneXion takes the Apache Web server and adds support for SSL 2.0. The company sells the server for commercial use as Stronghold: Apache-SSL-US. For noncommercial and educational use, Stronghold can be downloaded free.

Though it lacks a graphical interface, Stronghold: Apache-SSL-US's scripting program makes installation fairly easy.

SUITABILITY TO TASK

Stronghold Apache-SSL-US

Setup and configuration	Fair
Server management, administration, and access control	Poor
SSL security	Fair
Content and site management	Poor

Stronghold does not come in a shrink-wrapped version; you must download it from the Web. This server supports multiple Unix flavors; we tested the Sparc Solaris 2.5 version. Unix gurus will have no problem using the Unix commands to gunzip and tar the program after downloading it, but Unix newcomers will be relying on the one-page installation guide available on the Web at the download site. Community ConneXion told us a more detailed user's manual is under development.

Forget about a graphical user interface: You must install and configure Stronghold through the text-based, command-line-style Unix shell. But all in all, the simple step-by-step installation guide made installing the server almost painless. There was only one undocumented Web server setting—we had to change the Group setting in the HTTPD.CONF file to "nobody"—and we had to contact the vendor for the solution.

Other than five log files that report Web server activity and errors, SSL activity and errors, and agent activity, Stronghold includes virtually no other administrative or management utilities. Nor are there any content creation, site management, or search tools. But through the server's HTTPD.CONF configuration files, the Apache API, and the open source code, you can implement several levels of administrative and management controls. By modifying the HTTPD.CONF file, you set access control for the Web site as well as individual pages, configure SSL security, and manage multiple Web sites on a single Stronghold Web server. Alternatively, you can use CGI and the Apache APIs to develop your own user authentication, database connectivity, or server management tools. Stronghold also supports any Unix-compatible scripting language, such as Perl or Python. Additionally, you can set user privileges through the user log-on feature of the Unix operating system you're using.

For the really ambitious, the available source code of the Stronghold Web server can be recompiled to suit your own taste, though commercial users must consult with Community ConneXion before modifying the code.

If you prefer custom-tailored couture to department store clothes, the Stronghold Apache-SSL-US may fit you better than the ready-to-wear Web servers on the market. If you have the inclination and the know-how to work with open source code and a command line environment, this Unix-based Web server can satisfy most needs.—*Alex Ho*

Stronghold: Apache-SSL-US. List price: $495. Community ConneXion Inc., Berkeley, CA; 510-601-9777; www.us.apache-ssl.com. *Circle 472 on reader service card.*

O'Reilly & Associates Inc.

WebSite Professional

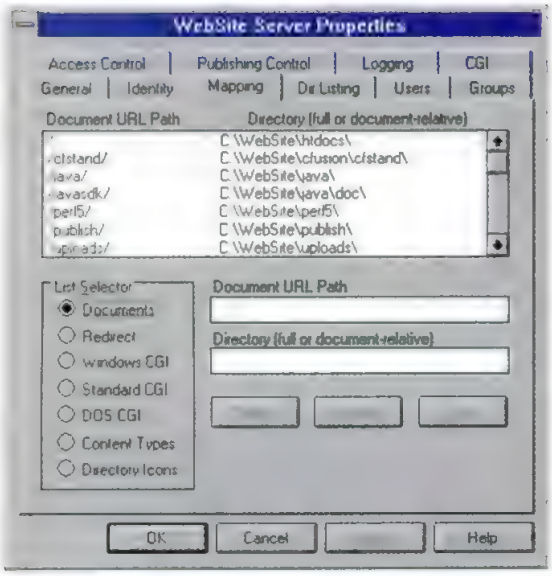
WebSite Professional ($499) shines with a strong feature set, excellent documentation, a comprehensive application programming environment, and the most polished interface of the Web servers in our roundup. It also includes a site-management tool, HTML editor, and text-indexing tool. Unfortunately, it had some of the poorest results on our performance tests: WebSite Pro was bested by every other Windows NT product we tested. Still, WebSite Pro makes a great solution for a Web site with low-to-moderate traffic.

WebSite Pro runs on Microsoft Windows NT Server or Workstation 3.51, as well as on Windows 95. It installs easily from a CD-ROM, and under Windows NT, it can run as either a service or an application. We tested it as a service on Windows NT Server.

Of all the products in this roundup, WebSite Pro has the cleanest and most functional server administration. You can access all server properties locally through a single Windows properties box containing ten well-organized tab screens. Each feature is clearly documented, and we found the documentation and context-sensitive help to be excellent. The only drawback to WebSite Pro—other than its lackluster performance—is its poor remote administration. It requires a complicated setup, because the remote machine must manage the Web server's Windows Registry information.

WebSite Pro's virtual server setup exemplifies an intuitive management interface. A straightforward procedure lets you configure your Web server with multiple domain names, which are useful for Internet service providers serving multiple companies or for internal servers serving multiple departments. Once you've configured multiple TCP/IP addresses in Windows NT, a wizard walks you through the creation of each host name, URL path, and physical directory location.

WebSite Pro has the most intuitive URL mapping tool of the ones we examined. A very simple interface matches the logical URL paths to physical directories. By default, the logical URL path follows the physical path of the same name. Web-



Of the products reviewed, WebSite Professional has the best-organized management interface.

Once you install the certificate, SSL is enabled for your designated server.

WebSite Pro includes a range of application development tools and APIs. But WebSite Pro stands out with its excellent documentation and examples. WebSite Pro includes SSI, three flavors of CGI, WSAPI (the WebSite Pro API that is compatible with ISAPI applications), and Cold Fusion Standard for ODBC database connectivity.

For document publishing, the server supports Netscape's HTTP put implementation. If you're using a browser that supports HTTP put, such as Netscape Navigator Gold, you can write files directly to a WebSite Pro server. This feature worked fine during testing, but we couldn't create directories on the server. WebView, the included site management program, ensures that URL links from the site are valid.

WebSite Pro maintains three customizable log files: a complete client-access log that includes referring URL and user-agent header information; an error log that reports all failed client requests; and a server log that can track CGI applications, authentication and security, and server and network statistics.

WebIndex, a search engine that resides on the server, lets users perform full-text searches of Web server content using a CGI program called WebFind. A Windows NT performance monitor agent lets network administrators view vital HTTP statistics and track performance. WebSite Pro also includes both HotDog, an HTML editor (reviewed elsewhere in this issue), and the Spyglass Enhanced Mosaic Web browser.—*RPL*

WebSite Professional. List price: $499. O'Reilly & Associates Inc., Sebastopol, CA; 800-998-9938; software.ora.com. *Circle 473 on reader service card.*

SUITABILITY TO TASK

WebSite Professional

Setup and configuration	Excellent
Server management, administration, and access control	Good
SSL security	Excellent
Content and site management	Good

Site Pro allows administrators to set virtual paths, a feature that lets you store files at a different physical location from the Web server.

WebSite Pro can apply flexible access control to URL paths (but not physical directory paths). You can add and delete users, groups, and realms (collections of users and groups) to or from the WebSite Pro access control list. You can also restrict access based on a user's TCP/IP address or domain name. But unlike The Internet Factory's Commerce Builder Pro, Microsoft IIS, or Process Software's Purveyor, WebSite Pro doesn't let you add user or group information from Windows NT's own directory database, which means that administering an intranet requires maintaining separate user and password lists.

For stronger security, you'll want to use WebSite Pro's built-in SSL 2.0. The WebSite Certificate Manager includes a wizard for requesting and importing certificates required of an SSL-secured server. As with other products here, after a public and private key are generated and server and company information is entered, the certificate request is sent to a certificate authority.

Quarterdeck Corp.

WebStar for Macintosh

WebStar for Macintosh ($795 list) is a capable, mature Web server that is easy to install and administer. Unfortunately, it had the poorest performance of all the products reviewed, probably because of WebStar's page cache limit. The WebStar package includes the WebStar server software; a copy of Adobe's Web page editor, PageMill; a public-domain FTP server; a Gopher server; and ListStar, a mailing list server. No search or Web site management tools are included.

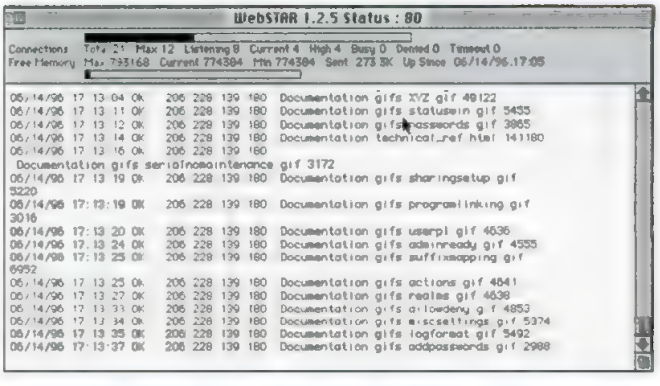
Quarterdeck also offers the WebStar SSL Security Toolkit ($895), which contains a separate SSL 2.0–compliant server to encrypt pages and requests. You'll still need to run the regular WebStar server for your nonencrypted pages, but both servers can run on the same computer.

WebStar—which has attracted a large and devoted following in the Macintosh universe—is the commercial successor to MacHTTP, a shareware Web server developed and distributed by StarNine Technologies. Quarterdeck acquired StarNine last year and rolled WebStar into Quarterdeck's growing suite of Internet tools. Quarterdeck also sells WebStar NT/95, a version of the server for Microsoft Windows 95 and Windows NT Server. We reviewed

SUITABILITY TO TASK

WebStar for Macintosh

Setup and configuration	Excellent
Server management, administration, and access control	Good
SSL security	Good
Content and site management	Fair



WebStar's real-time monitoring screen immediately shows you key server statistics, including the number of current connections.

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only WebStar for Macintosh because it has a much greater market share than the Windows versions. And it's clearly the server of choice for the Macintosh platform: Apple Computer offers it as the server software on its turnkey Apple Internet Server Solution line.

WebStar installs easily from the provided floppy disks or CD-ROM, and you don't need a powerful Mac to run it. If AppleScript and MacTCP are not installed, WebStar automatically installs them. We set up the WebStar server in about ten minutes. Quarterdeck provides a sample Web page as a starting point for building your own Web site content.

Despite its diminutive size, the 97-page WebStar manual includes all the information we needed to set up and configure the server; Quarterdeck provides the manual in both Adobe Acrobat and HTML formats on the CD-ROM. A wealth of WebStar information is also available on the Quarterdeck/StarNine Web page.

You run the WebStar Admin program on the server console to manage user names and passwords and to perform diagnostic and maintenance tasks. The WebStar Admin application can connect to any WebStar server on the local LAN, so you can administer several WebStar servers from any Macintosh workstation.

Quarterdeck also provides an AppleScript script and a CGI interface that lets you perform the same tasks via a browser. This feature allows remote administration from any browser-equipped Mac or PC or via the Internet.

You can run multiple WebStar servers on a single Mac. To do this, you leave the public server at the default port address (80) and assign a different port address to the private server. Each server can have its own user database, allowing you to permit or deny access to any server or page based on domain name, IP address, or user name.

WebStar logs the date, time, URL, address, and byte count of every page it serves by default. You can tailor the server log to include more or less data, including referring host name, the user's browser type, and the amount of time it took to complete each transaction. The log data is saved in a plain text format, making it easy to export to most database programs.

Several third-party add-ons provide hooks between WebStar and databases, including Claris FileMaker Pro, Microsoft FoxPro, and ACI's 4-D. For example, EveryWare's Tango provides access to such databases as FileMaker Pro and ODBC-compliant databases including Informix and Oracle. The recently announced WebStar API will allow applications to interact directly with WebStar. Quarterdeck has lined up several software vendors to develop WebStar plug-ins, including Apple and Claris.—*LF* □

WebStar for Macintosh. List price: $795. Quarterdeck Corp., Marina del Rey, CA; 800-525-2580; www.starnine.com. *Circle 474 on reader service card.*

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Web Database Tools

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PC MAGAZINE ONLINE

For updated news, reviews, and performance results of Web servers, visit InternetUser at PC Magazine Online (*www.internetuser.com*). From August 26 through August 30, you can join an online discussion about Web server technology at *www.pcmag.com/discuss.htm*.

WWW.PCMAG.COM

Data-driven Web applications are a hot new field, and vendors are scrambling to supply tools for creating them. Among these first-generation releases, some are astonishingly robust.

By Stephen W. Plain

If you're coming from traditional client/server development, the World Wide Web is a brave new world. Instead of scores of users, you can have millions around the world accessing your application through PCs, PDAs, Unix workstations, and any other computing platform that supports a Web browser.

It's also a scary new world. Although the Web may be technically just another client/server platform, it is radically different from traditional client/server environments, and many tried-and-true approaches no longer apply. It's also a field in which the established strengths of popular RAD tools may be irrelevant. If developers of traditional client/server applications need to pick their tools with care, that goes double when you're putting a database application on the Internet.

NEW MARKET, NEW TOOLS

In selecting products for this review, we found clear signs that the sudden demand for Web-focused development systems has taken many vendors by surprise. The eight tools we ultimately tested form an eclectic mix of widely varying degrees of maturity. Some, like Spider Technologies' NetDynamics, Haht Software's HahtSite, and NeXT's WebObjects were specifically designed for the Web and address many of the problems unique to a Web database application. Others, like Borland's Delphi Client/Server, JYACC's JAM WEB Toolkit, and ParcPlace-Digitalk VisualWave, are clearly short-term solutions meant to give developers an interim path to the Web.

Some major vendors seem to have been caught without an offering of any sort. Oracle and Microsoft declined to participate in this review altogether. Sybase's PowerBuilder and Optima++ were not shipping in time for a full review, although we were able to preview beta versions of those promising tools (for details, see the sidebar "Sybase Development Tools and the Internet").

We expect to see considerable maturation in the market over the next six months as these vendors come online and other second-generation tools begin to appear.

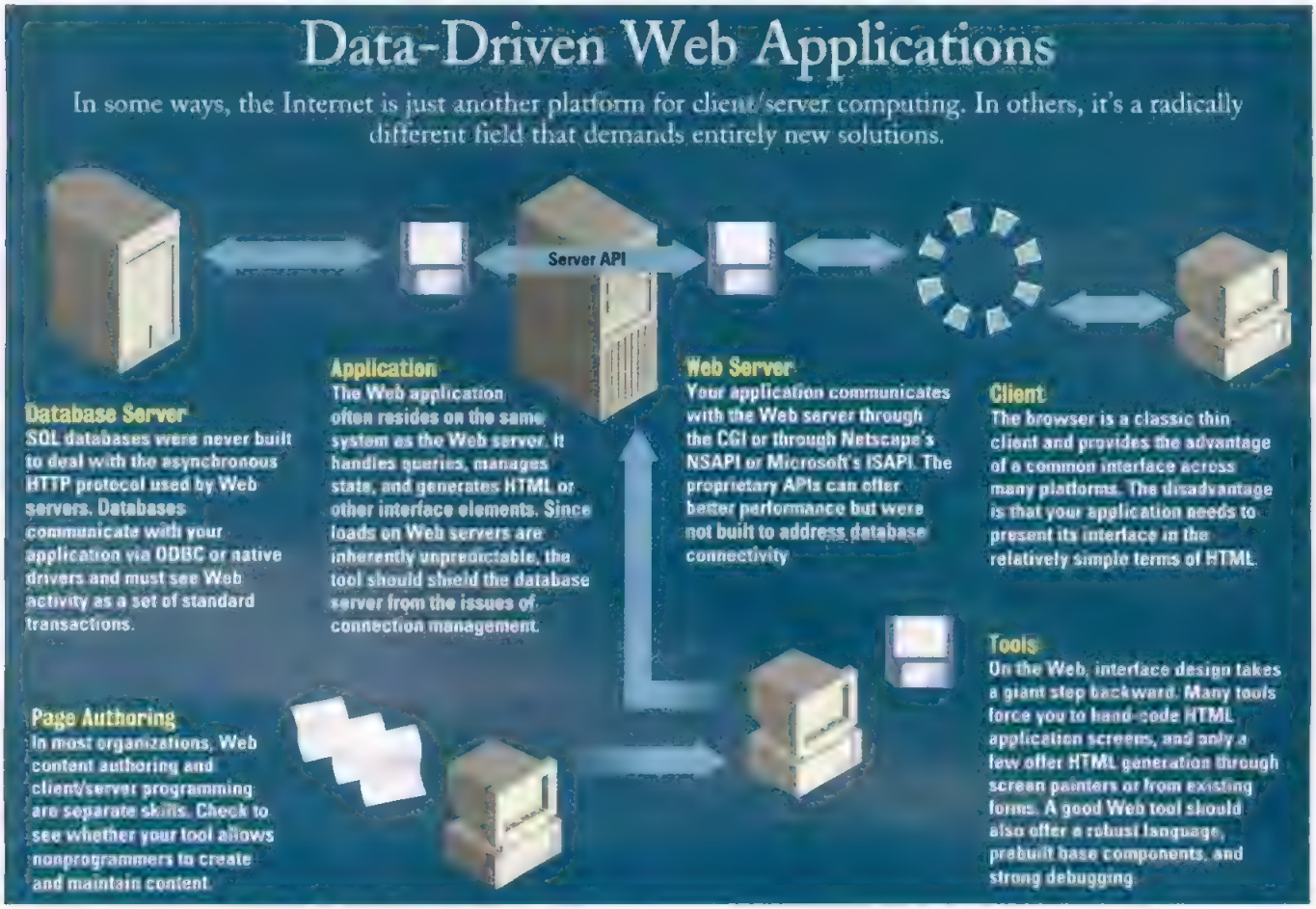
> Web database development is fraught with technical hurdles and demands lots of mental gear shifting from developers.

A few superb tools are already available. For small sites and some intranet applications, a solution based on PC databases may also be appropriate (see the sidebar "PC Databases: Scaled-Down Solutions").

SHIFTING MENTAL GEARS

Web database development is fraught with technical hurdles and demands lots of mental gear shifting from developers. For example, a LAN-based client/server application can take advantage of the power of the client PC to partition processing and data storage tasks. In contrast, a Web database is reminiscent of an old-time mainframe application, with the browser acting as an ultrathin client, analogous to a dumb terminal. While LAN developers are free to exploit the client machine's processing power and all the features of its windowing system, Web developers have to work within the limitations of the HTML standard, unless they want to make assumptions about users' local configurations.

Perhaps the most significant challenge facing developers is the stateless nature of the Web. A Web server responds to page requests either by returning an HTML page or by triggering an external application via a server API. Once the page is delivered or the application executes, the transaction is complete and the connection closes. The server makes no provision for storing vital information about the application and the user within the ap-



plication. This approach is fine for delivering hypertext documents but creates huge headaches for anyone trying to design a tight multipage database application.

To overcome this problem, a Web application needs either to maintain session information or to pass state information back and forth to the user via embedded information in the HTML. Either way, a unique session identifier is usually generated on the server end. What information a Web database application maintains and how smoothly it makes it available to the database developer are big considerations in choosing a development system.

Another difficult problem is the unpredictable load a Web application may encounter. Load management on the Web involves a number of factors, all of which must be taken into consideration. The first is the application server's ability to handle a large number of simultaneous connections. The more sophisticated products use a distributed processing architecture that can route application requests among multiple physical machines; most, however, simply rely on the Web server to limit the number of simultaneous connections (see "Linking Web Servers with Live Data" in the Web Servers section of this cover story). Another consideration is the number of simultaneous database connections required: A Web database product that can make frugal use of database connections is a real plus. While some products offer database connection caching and sharing among Web sessions, others require a dedicated connection for each application process spawned.

The inefficiency of traditional CGI scripts is yet another problem. Although CGI is a common denominator among most Web servers, it is not very elegant when it comes to memory management. Each CGI call spawns a separate process of its own, unloading it when the request has been fulfilled. This adds memory and performance overhead. The more efficient way of connecting an external database management system to a Web server is through Netscape's NSAPI or Microsoft's ISAPI, proprietary APIs that enable the application to work with separate processes within the Web server's own address space and provide better control over the Web server itself. One of the tools, NetDynamics, uses server-side Java as the basis for your application.

Because of the diversity of offerings, the immaturity of the tools, and the challenging nature of the Web architecture, picking an appropriate solution for Web database development is no easy task. The eight product reviews that follow will give you a feel for the benefits and pitfalls of the options you have today.

NetDynamics 2.0
WebObjects Enterprise 2.0

Our winners go well beyond the usual client/server technologies to address the special demands of Web database development. NetDynamics 2.0, from Spider Technologies, is arguably the most ambitious Java tool in existence. Applications are generated as server-side Java code, and the NetDynamics application server elegantly handles data access, load balancing, and state-information management. The environment provides excellent security control, from managing application flow to setting database privileges. The NetDynamics Studio is a productive GUI development environment whose wizards help you build pages and SQL queries easily. NetDynamics is a strong tool for enterprise sites, but its ease of use and price will appeal for sites of all sizes.

NeXT's WebObjects Enterprise 2.0, based on NeXT's object-oriented frameworks, offers a tremendously powerful collection of tools for developing enterprise-level Web database applications. Its Enterprise Objects Modeler provides full application and data modeling capabilities, while the Enterprise Objects Framework offers the ability to abstract business logic from the database back end and the application interface. WebObjects also addresses the important areas of state management and transaction processing. WebObjects Enterprise is a complex tool, but for building heavy-duty sites, it's the best we've seen.

Borland International Inc.

Delphi Client/Server Suite

Borland International's Delphi enjoys a deservedly high reputation as a tool for building LAN-based client/server systems. If you're looking to build client/server applications for the World Wide Web, you'll find that Delphi Client/Server Suite 2.0, the current release, offers a powerful if somewhat brute-force solution that demands a heavy investment in Pascal DLL coding and manual Web page construction.

Whatever the approach lacks in RAD-like ease and elegance, however, is made up for by the speed and flexibility of the deployed site. Delphi now incorporates support for both ISAPI and NSAPI, in addition to CGI. That, along with Delphi's ability to generate DLLs, gives you enormous versatility and plenty of performance. Delphi applications must be deployed on a Windows server platform, typically Windows NT, and used with a Windows-based Web server.

Thanks to licensing agreements, Del-

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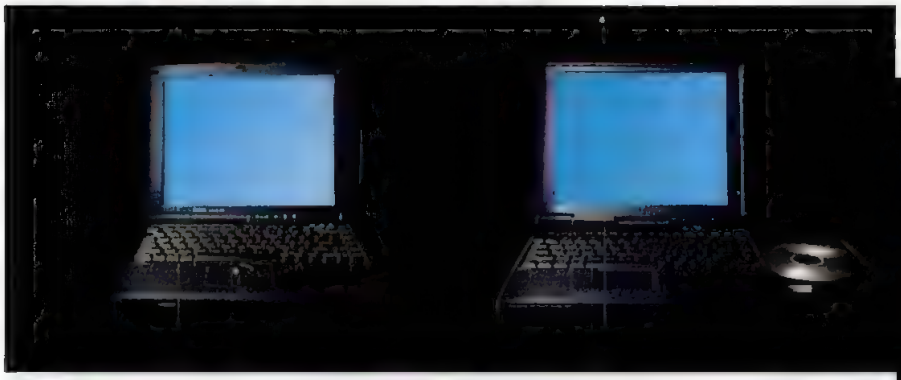

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phi now includes two strong Web-focused tools: DeltaPoint's QuickSite, a capable HTML editor, and the Internet Solutions Pack from NetManage, a collection of ActiveX controls well-suited for developing custom intranet applications.

SITE CONSTRUCTION

Building the test Web site for this review involved two distinct processes. We began by creating and managing the HTML pages that provide the user front end using QuickSite. These HTML pages act as templates and include special inserted tags (we used "%S") to identify data fields that will be manipulated later. Although building pages in QuickSite is straightforward, Delphi is not able to generate HTML forms automatically by querying the column definitions of your database.

SUITABILITY TO TASK

Delphi Client/Server Suite

	Power	Ease
Interface development	Fair	Fair
Database connectivity	Good	Excellent
Application partitioning	N/A	N/A
Database development	Good	Good

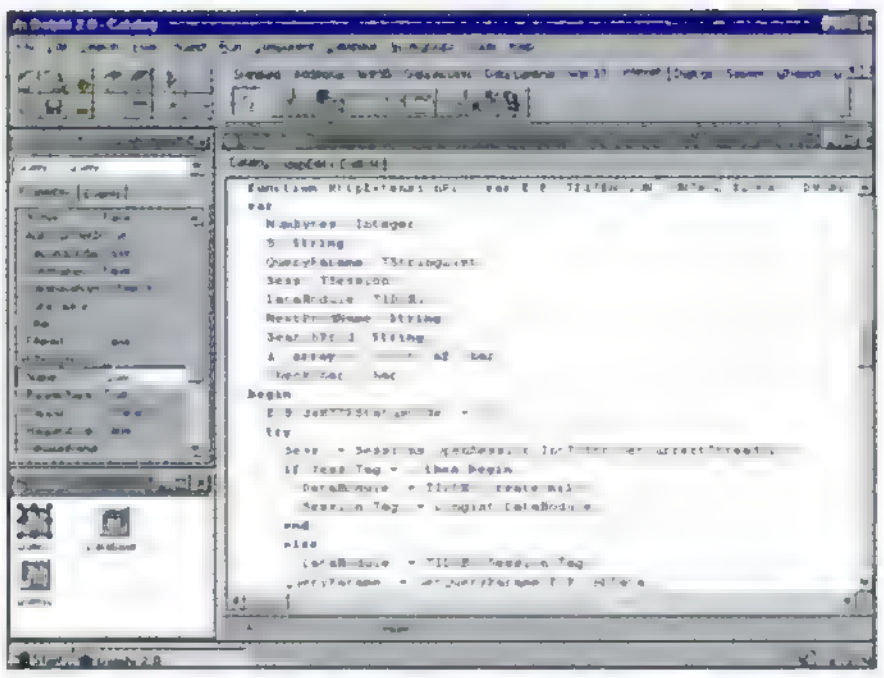
N/A—Not applicable: The product does not support this feature.

The next step is to create a DLL for data-driven pages (a single DLL can run multiple pages, if desired). In operation, the browser actually opens the DLL via ISAPI or NSAPI, instead of opening the HTML page itself. The DLL reads in the generic HTML file and populates the predefined tags with values retrieved from a database query that is executed through the DLL. It then returns a final HTML string back to ISAPI and ultimately to the user's browser via HTTP.

One advantage to a DLL-based approach is that it allows you to program your Web site to do just about anything. Another is that native 32-bit DLLs inherently let you take advantage of Windows NT's multithreading and Web-server resource management.

But building those DLLs can be a time-consuming process. And because they don't require visible components, you will not be leveraging the strength of Delphi's excellent graphical painters (remember that only an HTML string can be sent back to a standard browser). For the most part, developing Web-based applications feels like a step back to the days before tools like Delphi existed. Most of your time will be spent coding in Pascal, and you'll need a high degree of programming expertise.

One major advantage of Borland's Object Pascal language is that it lets you quickly build a library of objects that will speed future development. As an example, Borland took a few hours to create an HTTP Pascal unit for this review that can be compiled with your DLL. This library hides the actual HTML codes from the developer, substituting functions like the ability to populate a drop-down list box control on the page with a database query. Borland will make this library freely available on its Web site.



Delphi's graphical IDE makes it easy to manage projects, but you'll spend much of your time just writing code.

DATABASE CONNECTIONS

Database support is provided by the Borland Database Engine (BDE), which must be installed and configured on the Web server, allowing access to all of the databases supported by the Delphi environment. The extensive list includes native support for IBM DB2 (16-bit version only), Informix, Interbase, Microsoft

DESKTOP MANAGERS

How to Read the Suitability to Task Boxes

Suitability to Task

Interface development To score this task, we rated any supplied facilities for generating the HTML screens ultimately displayed in the end user's browser. Tools that forced us to code screens by hand fared poorly here. Did the tool provide graphical aids for screen design? Did it provide high-level programmatic interface objects? Could we generate HTML from existing application screens? Tools that use knowledge of the underlying database or model to generate screens scored extra points. Support for client-side enhancements through Java was also a plus, as was support for complex reports.

Database connectivity This task score rates the connections between database, server-side application, Web server, and client. We looked for tools that support ISAPI and NSAPI as well as CGI. We looked at how well the tool performed session management and whether it offered real transaction processing support. Were both native and ODBC drivers provided for SQL databases? Tools that permit deployment of an application on a variety of server platforms earned extra points.

SUITABILITY TO TASK

Product Name

	Power	Ease
Interface development	Poor	Poor
Database connectivity	Fair	Fair
Application partitioning	Good	Good
Database development	Excellent	Excellent

Application partitioning This task looks at the extent to which the tool supports tiered application deployment. Are applications logically separable into interface, business process, and data-access layers? Can the back-end application be physically partitioned?

Database development This task rates the effectiveness of the tool at building on existing databases or designing new ones. Does the tool offer a graphical, project-based UI that provides an overview of application objects and database entities? Is it possible to work with high-level data-access objects? Does the tool offer data-modeling capabilities? We also looked for a powerful standard programming language, an extensible object model, and a good selection of prebuilt program objects.

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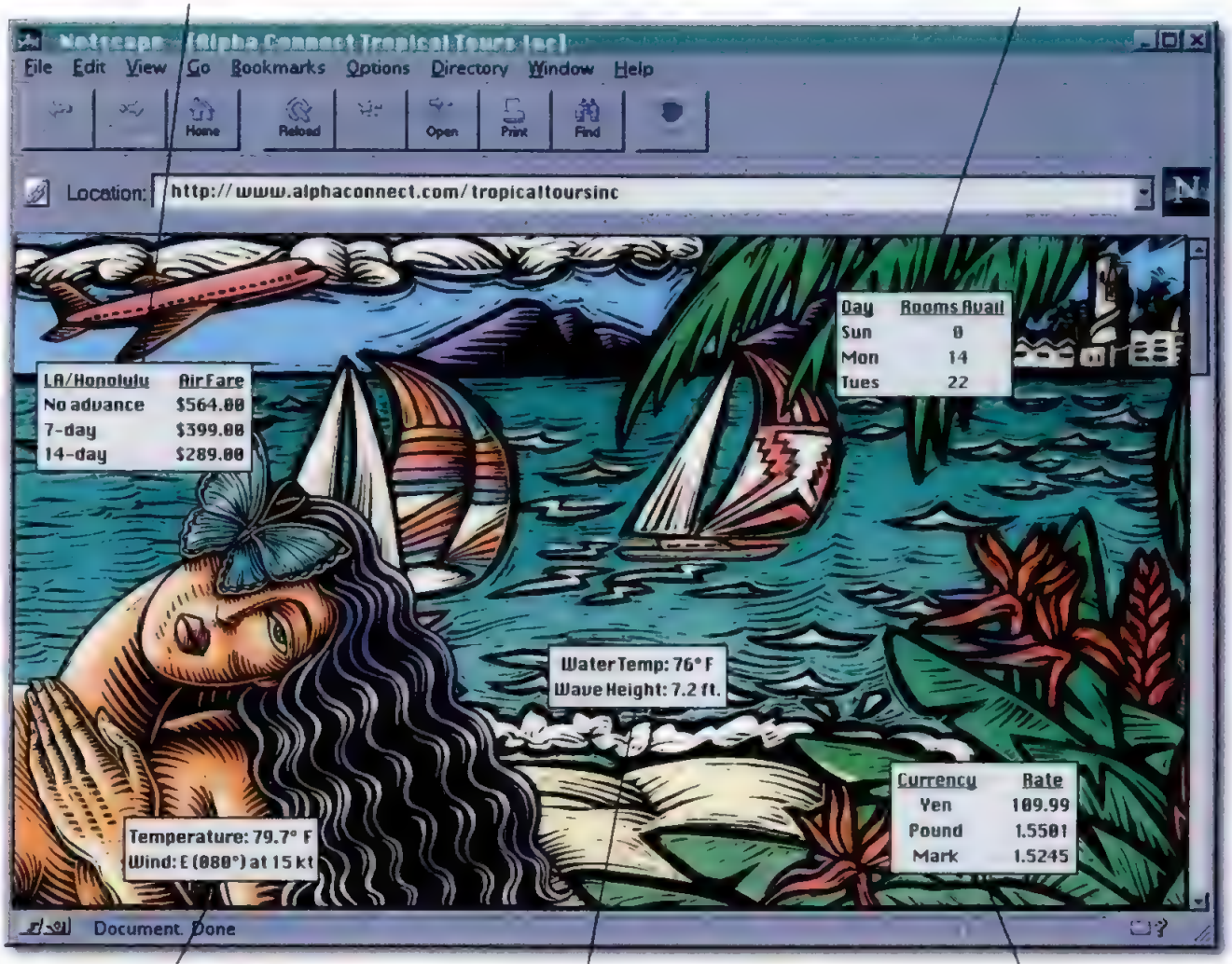

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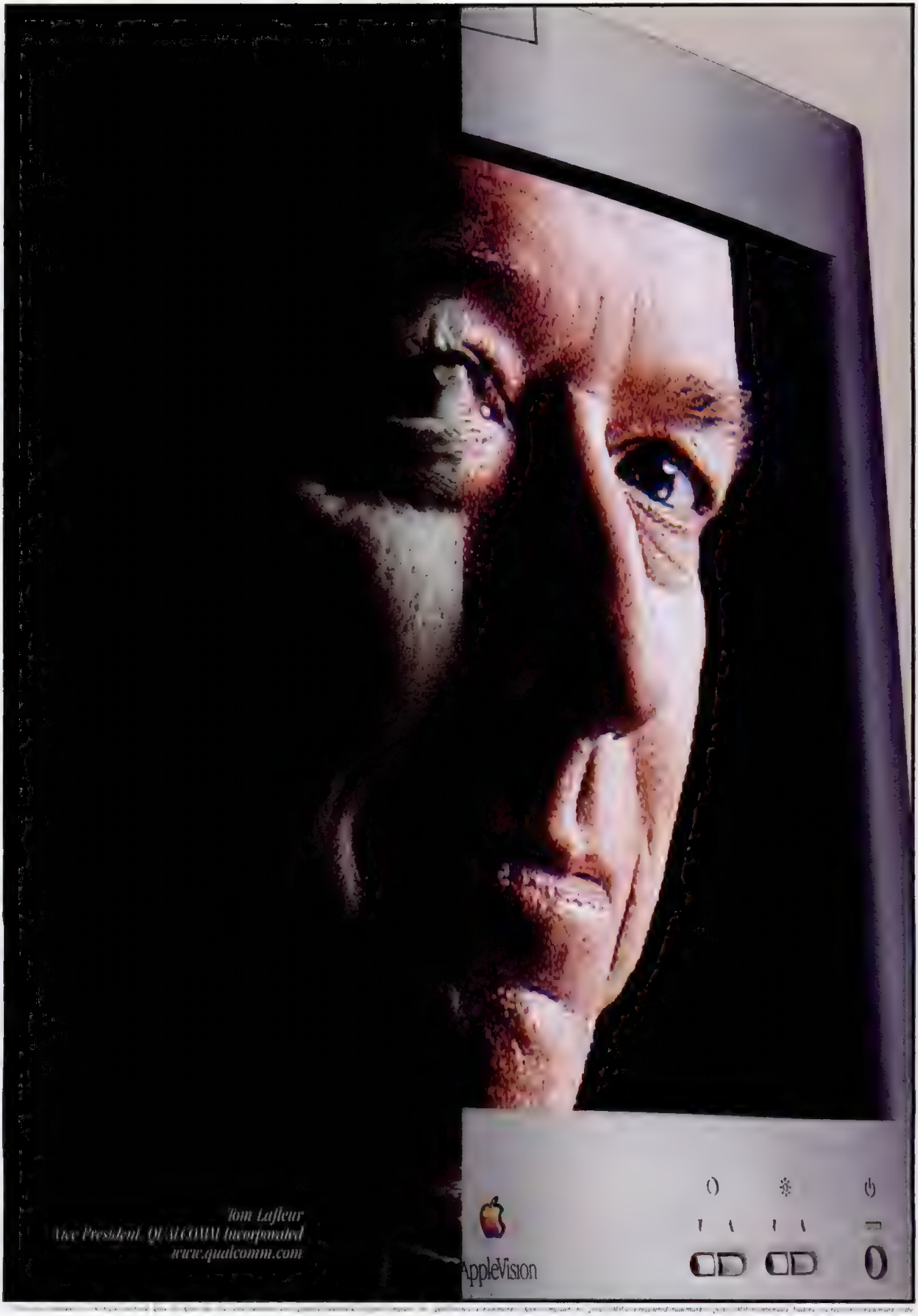

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PC Databases: Scaled-Down Solutions

By Rick Dobson

Small business hosting their own Web sites or intranet developers building internal applications may not need the power of a SQL database to drive their applications. A number of PC databases offer the required sophistication and robustness to do the job credibly for a much lower cost. Each of the tools below offers some Web development capabilities as add-ons to the core product.

MICROSOFT ACCESS

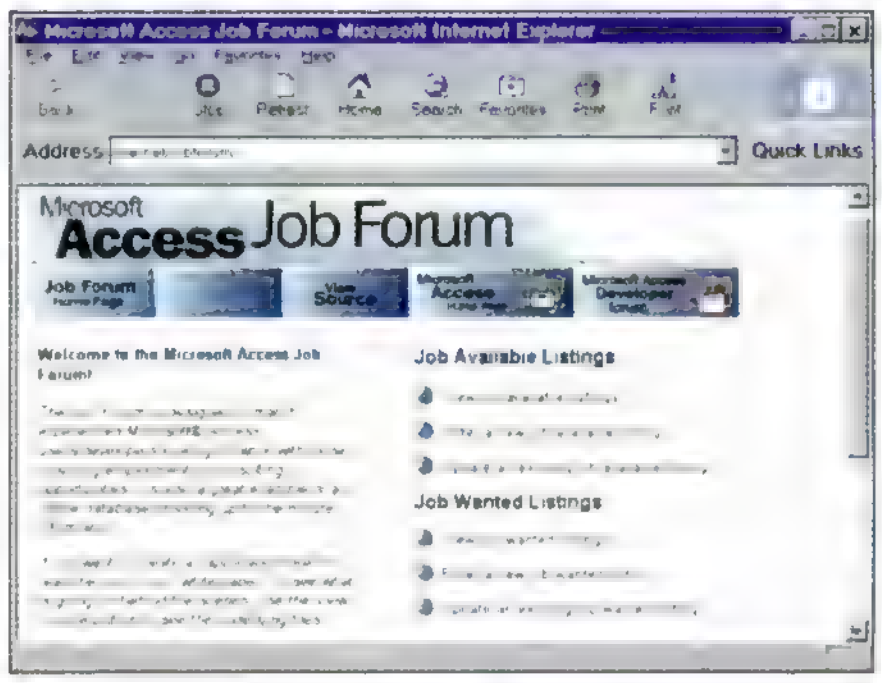
Microsoft Access addresses Web development issues from three angles. At the high end, developers can write files for the Internet Database Connector (IDC) in Microsoft's Internet Information Server (IIS) containing custom SQL and HTML code.

This solution does not use the Access development environment, only its ODBC driver and an Access data file. An .IDC extension file names the ODBC data source and defines the query. A second .HTX extension file formats the return set for display by a remote browser.

To appeal to a broader range of users, Microsoft released the IIS Add-In for Microsoft Access for Windows 95. This product automates the creation of the .IDC and .HTX files, but it still permits customization after creation.

Microsoft dbWeb offers a richer Wizard-like approach to developing dynamic Web pages that rely on Access databases. While dbWeb is ISAPI-dependent, it does not use the IDC.

Another benefit is that dbWeb can concurrently mix and match Access data with data in Microsoft Visual FoxPro, Oracle, SQL Server, and other databases that have thread-safe ODBC drivers. (Microsoft Corp., 800-621-7930; *www.microsoft.com /msaccess.*)



An Access-based application on Microsoft's corporate Web site shows that even production apps are possible.

MICROSOFT VISUAL FOXPRO

Microsoft Visual FoxPro 3.0's approach to dynamic Web pages is similar to dbWeb's. It offers Wizard-driven development, and it does not rely on the IDC. Because the FoxPro approach is not ISAPI-dependent, it does not require Microsoft IIS to run. Implementation depends on three key components: the WWW Search Page Wizard, a Common Gateway Interface (CGI) script, and the Visual FoxPro Information Server.

The browser communicates with a selected CGI script through an HTTP service. In the background, the FoxPro Information Server polls continuously for new instances of CGI scripts. After processing SQL code associated with a CGI script, the VFP Information Server inserts the return set in an HTML document. The CGI script picks up the HTML page and passes it to the HTTP service for transmittal to the browser. (Microsoft Corp., 800-621-7930; *www.microsoft.com/vfoxpro.*)

BORLAND'S VISUAL DBASE PROFESSIONAL

Borland International's Visual dBASE Professional offers a pair of tools for creating data-driven Web pages. The Table Search WebExpert offers an easy way to create dynamic CGI apps for querying tables. With this point-and-click method, development is as easy as completing entries on an Expert form. The bundled DeltaPoint WebTools for Visual dBASE includes three classes that offer granular control over input forms and published Web pages from the familiar environment of Xbase code. Two classes help manage CGI scripts, and the third provides very detailed control over HTML formatting. Together, they allow developers to control the query form and the display of the return set from within the familiar confines of their applications development environment.

This product is also of interest, because it runs on Windows 3.*x* and Windows 95 servers, as well as on Windows NT (the Microsoft Access offerings work exclusively on Windows NT.) The reduced hardware requirement may be particularly appropriate for applications based on PC databases, as opposed to back-end databases. (Borland International Inc., 800-932-9994; *www.borland.com.*)

MICRORIM'S R:WEB FOR WINDOWS

R:WEB, from Microrim, builds on the company's R:BASE 5.5 database to provide query and write access to an R:BASE or ODBC database across the Web. R:WEB lacks table and frames support, putting its output capabilities below par. But graphical forms-design tools in R:BASE, combined with what can be very minimal code requirements, make it an attractive approach for applications that post to the server. Its ability to talk to other databases through ODBC drivers and its proprietary link to dBASE files make it an option for applications developed with other databases. R:BASE is a particularly robust PC database that supports the relational model, uses a data dictionary, and exposes a SQL interface. (Microrim Inc., 800-628-6990; *www.microrim.com.*)

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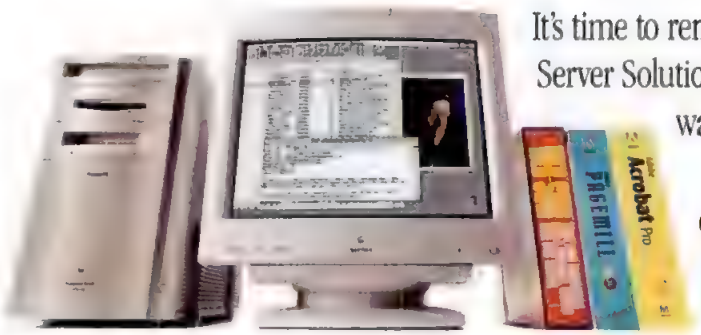

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SQL Server, Oracle, and Sybase SQL Server. ODBC and IDAPI data sources are also supported, and BDE can manage heterogeneous database queries.

BDE loads into memory on the Web server with the first ISAPI or NSAPI call. From then on it is available and manages the database connections. By staying resident while the Web server is operational, it provides persistent database connections for multiple users—this in contrast to typical CGI-based applications, which connect and disconnect from the database with each request. BDE minimizes the number of required database connections and provides connection management by creating and deleting connections based on load.

Delphi offers quite a few options when it comes to LAN-based reporting. It ships with the full-featured ReportSmith as well as Quick Soft Development's Quick Reports, for less intensive reporting tasks. Neither of these translates to the Web environment, though. In theory, you can present any data that can be derived from a SQL query, but building complex report types, such as crosstabs, is reserved for the true SQL and Pascal gurus.

Our tests did not require us to use the bundled Internet Solutions Pack, but it forms a valuable addition to the product. The controls appear on the toolbar's Internet tab and integrate seamlessly with the Delphi environment. You can add a Web browser to a Delphi application simply by dropping three controls (a browser control, a drop-down list box for typing in URLs, and a push button) on the form and adding one line of code. Other NetManage controls allow you to work with Internet mail, FTP, or network newsgroups.

For LAN development, Delphi has come a long way in a short time, thanks to its 32-bit, object-oriented development environment, its rich Pascal language, its intuitive IDE, its support for ActiveX (i.e., OLE) controls, and its true compiler. For the Web, where speed and response time are of paramount concern, Delphi's compiled DLLs and ISAPI/NSAPI support are a bit short on elegance, but they're a tough combination to beat.—*Mark Childers*

Delphi Client/Server Suite 2.0. List price: $1,999.95. Borland International Inc., Scotts Valley, CA; 800-932-9994, 408-431-1000; fax, 408-431-4122; www.borland.com. *Circle 457 on reader service card.*

ACI US Inc.

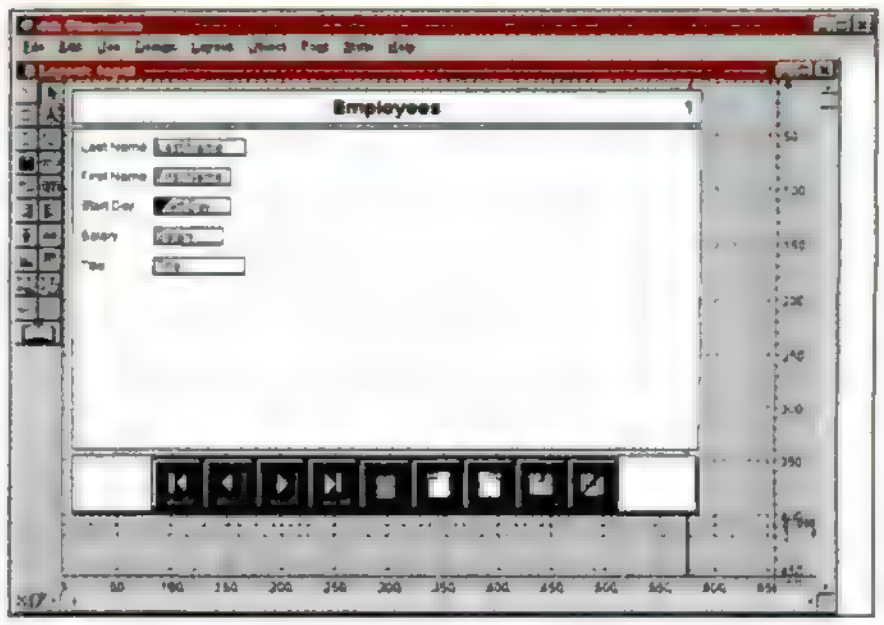
4D Web SmartServer

Long one of the most popular database development tools on the Macintosh, ACI US's 4th Dimension (4D) was recently ported to Windows and now offers a cross-platform solution for organizations with heterogeneous clients. The 4D Web SmartServer is a new addition to the product line that includes a single-user version of 4D and four third-party add-ons providing various Internet-related functions. The Macintosh version of 4D Web SmartServer was shipping during our testing, but the Windows version was still a few weeks off. Although 4D Web SmartServer offers some Web functionality, it does not offer a tight, comprehensive solution for Web database development.

4D VIEW

At the heart of the package is the company's flagship 4D development product, which maintains the look and feel of the Macintosh even on the Windows platform. There are three main environments in 4D: Design, User, and Runtime. Each has a number of individual windows, and you can switch among the environments through a menu at any time.

The Design environment is where you build your application; windows include Structure, Layout, Procedure, Menu, Passwords, Lists, and Processes. The Structure window is where you design your database, using a graphical representation as your guide. Layouts are 4D's version of forms, which you edit using the product's painter. Lists are simply sequences of user-defined values that you can use as choices for Layout controls. The Process window lets you manage individual 4D processes, one of the more interesting features of the product. 4D uses an internal multiprocessing architecture and normally runs with a few standard processes; however, you can launch your own processes from your application to spin off various tasks at the same time. These 4D processes do not manifest themselves as separate threads on Windows NT.



An Input Layout template in 4D Web SmartServer offers prebuilt VCR-style database navigation capability.

The User environment allows you to work with data and is used primarily for such tasks as inserting, deleting, and searching for information in your database. The Runtime environment lets you run and test your finished product just as that product would run under the company's optional runtime module.

In addition to 4D, the 4D Web SmartServer package includes Netlink/4D from Foresight Technology, DataWave from DataCraft, PDM Internet Tools from Pacific Data Management, Internet Toolkit from JCA, and the company's own 4D Insider. Each module performs a specific function, and all of the modules are available individually from their respective vendors as well.

NetLink/4D connects your 4D database to a Web server using CGI. The 4D Web SmartServer does not provide any state or session management automatically, but you can accomplish these through coding. By using multiple 4D processes as listeners for user connections, along with a separate one to manage these listeners, you can track page and session state. Of course, you also have to pass an ID code of your own back to the user in the HTML.

The PDM Internet Tools module is a 4D extension that provides language support for various Internet protocols such as FTP, TCP/IP, Finger, and Ping. The Internet Toolkit provides a very limited HTTP server designed for prototyping your application. This product was not available for Windows during our testing, and the company stressed that it is not designed to be used as a production server. DataWave and 4D Insider work hand in hand. DataWave is a group of 4D libraries that let you selectively publish your data-

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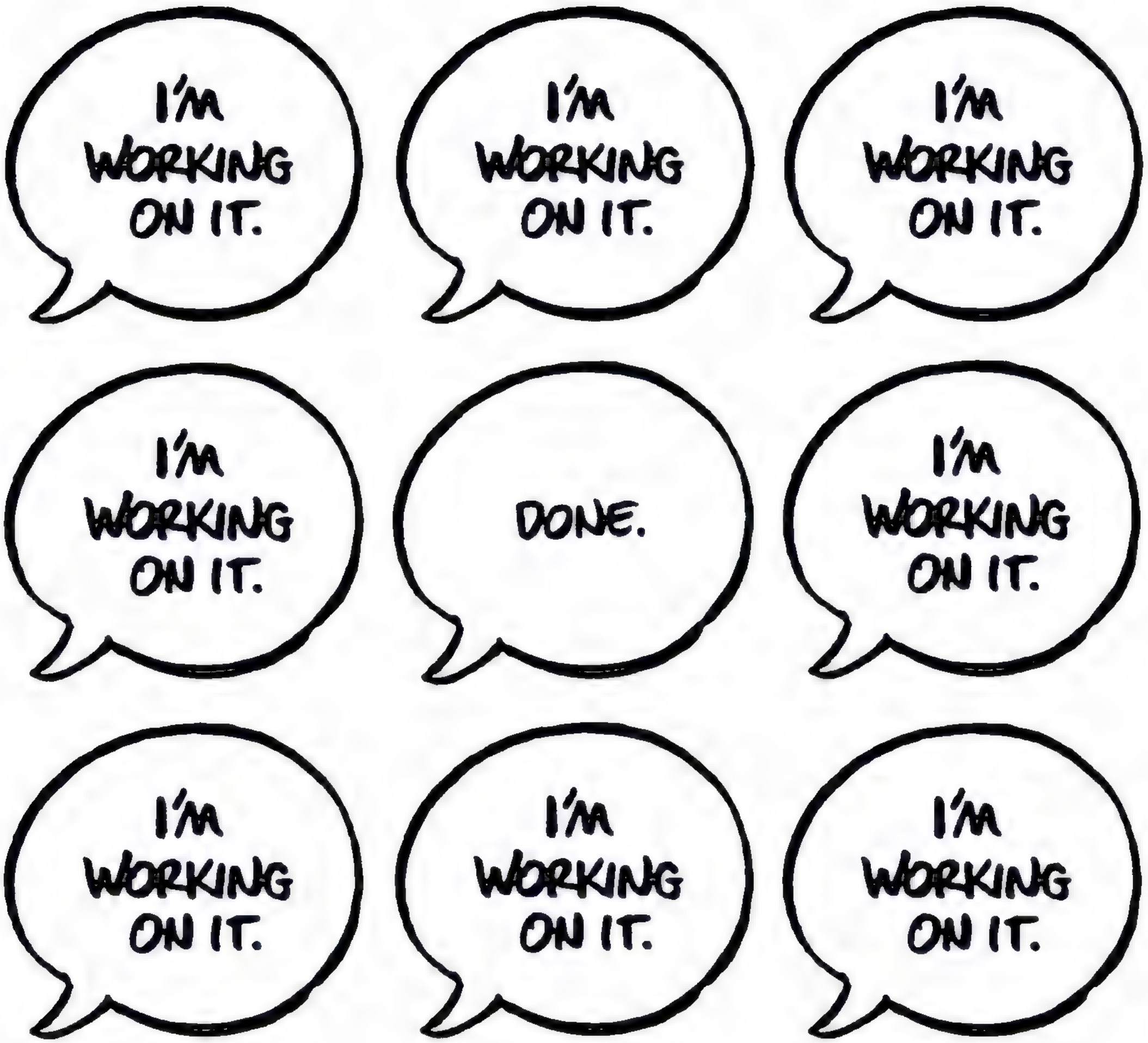

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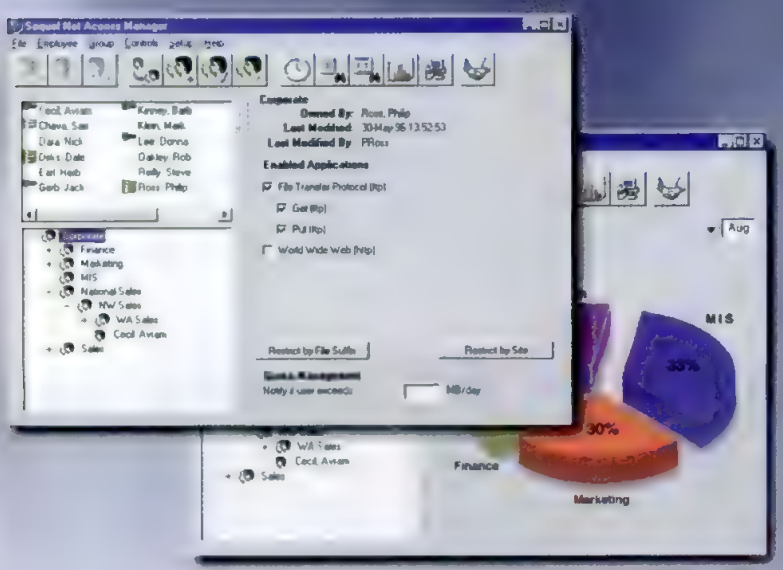

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B209

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base elements, such as tables and fields, in a read-only form to the Web. 4D Insider is ACI's library-management tool that lets you browse routines and libraries to view their dependencies.

Although our testing began only a few weeks before the product was due to ship on the Windows platform, it was clear that the company still had some configuration issues to iron out. But 4D itself was quite stable and allowed us to build an ordinary 4D application without a problem. We found the graphical Structure window very productive, since it let us create a schema quickly and create relationships simply by dragging lines between the tables.

SUITABILITY TO TASK

4D Web SmartServer

	Poor	Fair
Interface development	Poor	Fair
Database connectivity	Poor	Fair
Application partitioning	N/A	N/A
Database development	Good	Fair

N/A—Not applicable: The product does not support this feature.

The Layout window was also effective, though slightly unconventional. 4D layouts can be either Input or Output layouts and used in input screens or reports, respectively. When we created a new layout, we were presented with a modest selection of three output and five input templates, as well as a custom option for designing our own. The various templates ranged from simple rows of fields to forms with VCR buttons at the bottom to provide common navigation and editing operations. 4D includes several predefined actions that you can attach to buttons without coding.

Instead of separate controls for text boxes, labels, combo boxes, and list boxes, 4D uses a single field control. Double-clicking on a field control brings up a single dialog that lets you change its behavior and appearance. The lists you define in the Lists Window can be used as the values for a combo box or a list box, referred to in 4D as Choices and Required, respectively. You can also exclude specific values according to a list. Although this approach is a bit odd for a Windows product, the single-dialog approach works well.

We ran into problems when attempting to move our application to the Web, since we were unable to get NetLink/4D to operate properly. The vendor subsequently reported that the problem we experienced was a configuration issue that could be easily rectified; we were unable to retest, however, because of time restrictions. Although DataWave was not yet available for Windows, we got a glimpse of the Macintosh version of the module and found it easy to use but limited in application. It offers a drill-down look at your data, but in a read-only mode. Although this may be useful in some situations, it was not well suited to our testing script.

4D is a mature database that has stood the test of time on the Macintosh and is finding its legs on Windows. But the 4D Web SmartServer bundle appears to be an interim solution that is not well suited for creating interactive database applications. Though we were unable to see the product in action on the Web, it should be available by the time you read this.—*Stephen W. Plain*

4D Web SmartServer. List price: $1,195. ACI US Inc., Cupertino, CA.; 800-881-3466, 408-252-4444; fax, 408-252-0831; www.acius.com. *Circle 458 on reader service card.*

HAHT Software Inc.

HahtSite

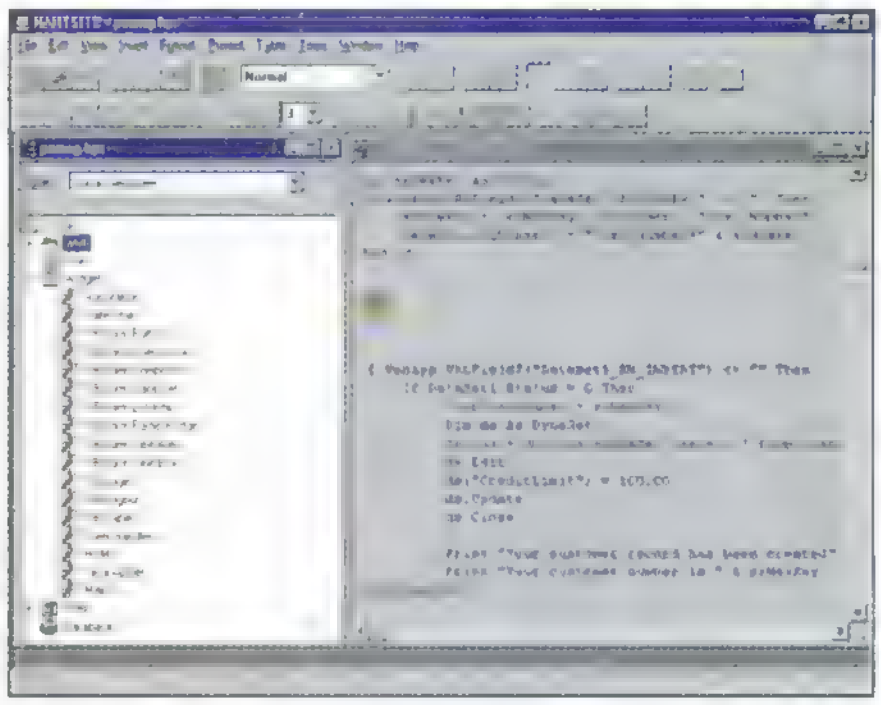
HAHT Software's HahtSite 1.0 is one of the few tools actually designed from the ground up specifically for developing data-driven Web applications. While not as architecturally robust in this first release as NetDynamics, HahtSite's use of industry-standard Basic scripting and its tools for writing reusable objects make it an attractive solution nonetheless. We finished testing HahtSite just days before its commercial release. Like many Internet tools, it showed signs of having been rushed out the door to meet the demands of an exploding market. Its sound foundation, however, should make it a major player.

The HahtSite solution consists of the client-based HahtSite IDE and a separate server-based HahtSite Engine that communicates with the Web server via CGI (ISAPI and NSAPI support are slated for the next major release). The IDE can run on either Windows 95 or Windows NT. The Engine runs only on Windows NT at present, but the company plans a Unix version soon. You create your entire application within the IDE and then publish it to an Engine site with the DOS COPY command or by FTP. HahtSite 1.0 uses ODBC for all of its database connectivity; future versions are slated to include native drivers.

DEVELOPMENT ENVIRONMENT

The core of the HahtSite IDE is an expandable folder tree for each project. The standard folders are Links, Widgets, Sites, and Web. The Links folder lets you create commonly used URLs that you can later drag and drop onto individual Web pages. Widgets are the design-time controls with which you build the pages that drive your application, and Sites are the servers on which you can publish your application. You can create your own folder hierarchy within the Web and Links folders to organize your application objects further.

Web pages in HahtSite can be either HTML or code modules written in the company's Basic, licensed from Summit Software and compatible with Microsoft Visual Basic (VB) 3.0. One of HahtSite's most impressive features is the way it deals with code and HTML interchangeably. You can mix HTML, Basic, and widgets within a page, the top-down order of objects determining the page's execution flow. This makes it easy, for example, to produce HTML Web pages conditionally using if-then statements. In addition to the folders, the tree contains a database object that can contain multiple ODBC connection definitions.



The HahtSite IDE uses an expandable folder-tree metaphor for managing projects.

HahtSite widgets are somewhat analogous to custom controls in VB but are written in the same Basic language used in the rest of the product. This makes it possible for you to write your own widgets and lets programmers produce widgets for use by Webmasters with limited coding ability. Widgets provide a convenient programmatic interface for development; they do not appear in the HTML pages the end user sees.

The base product ships with a selection of widgets that includes all the usual UI controls, such as combo boxes, buttons, and check boxes, as well as other controls that provide more specific functions, such as mailto, page date/time stamping, and Java applet embedding. Other standard widgets provide log-on, log-off, and direct table access for databases. Since widgets are written in Basic, you can extend the product by creating your own, to speed development and establish corporate standards. To write your own widgets, you'll need the HahtSite SDK, soon to be released at an additional cost of $695.

When you publish an application to the HahtSite Engine, it is compiled to p-code and moved to the server machine. The HahtSite server is a Basic interpreter; when published, widgets are converted to Basic code and HTML to Basic Print statements. The HahtSite server must reside on the same machine as the Web server. This may limit HahtSite's appeal for high-volume use. The company plans to address the need for distributed execution but did not have any details concerning delivery.

HahtSite maintains state information for each session by generating a unique state identifier for each page and tacking it onto the URL as necessary. This occurs transparently to the developer, who can use ordinary Basic global variables to hold information needed across multiple pages. In practice, it is also very easy to build complex sequences of operations into a single page. While coding our test application, we found it easy to implement a customer search form and a complete order entry form within the same HahtSite Web page by using if/then statements to detect the values of local variables and conditionally show the appropriate widgets.

A PRODUCT TO WATCH

During testing, HahtSite proved effective but not completely stable. We experienced a few random crashes and the drill-down feature of the product's standard dbTable widget failed intermittently. We suspect that a maintenance release will be needed to fix some of these bugs. The widgets allowed us to add form controls and database tables quickly, but we found ourselves wishing for even more standard widgets in the base product. We also found ourselves writing lots of SQL code by hand. The product's dbDataSet object, for instance, lets you link to a data source and a record source, much like the standard data-bound controls in VB, but there was no SQL query builder to aid in constructing complex queries. In code, we used dynasets to manipulate database information and changed selection criteria through the Where property, again following traditional VB techniques.

SUITABILITY TO TASK

HahtSite

	Power	Ease
Interface development	Good	Excellent
Database connectivity	Fair	Excellent
Application partitioning	N/A	N/A
Database development	Fair	Excellent

N/A—Not applicable: The product does not support this feature.

Despite some warts, it is easy to recognize HahtSite's importance in this emerging market. It is a natural choice, at least initially, for developers of VB-based front-end applications looking to migrate to the Web. Any business logic or utility routines written in VB are directly importable into HahtSite, and the product's smooth integration of its Basic language with HTML makes it easy to overcome the paradigm shift to the stateless Web. HahtSite is a product to watch and has a good shot at becoming a preferred solution for Web database development.—*Stephen W. Plain*

HahtSite 1.0. List price: HahtSite IDE, $995; HahtSite Engine, $2,495. HAHT Software Inc., Raleigh, NC; 888-438-4248, 919-783-7803; fax, 919-783-7801; www.haht.com. *Circle 459 on reader service card.*

JYACC Inc.

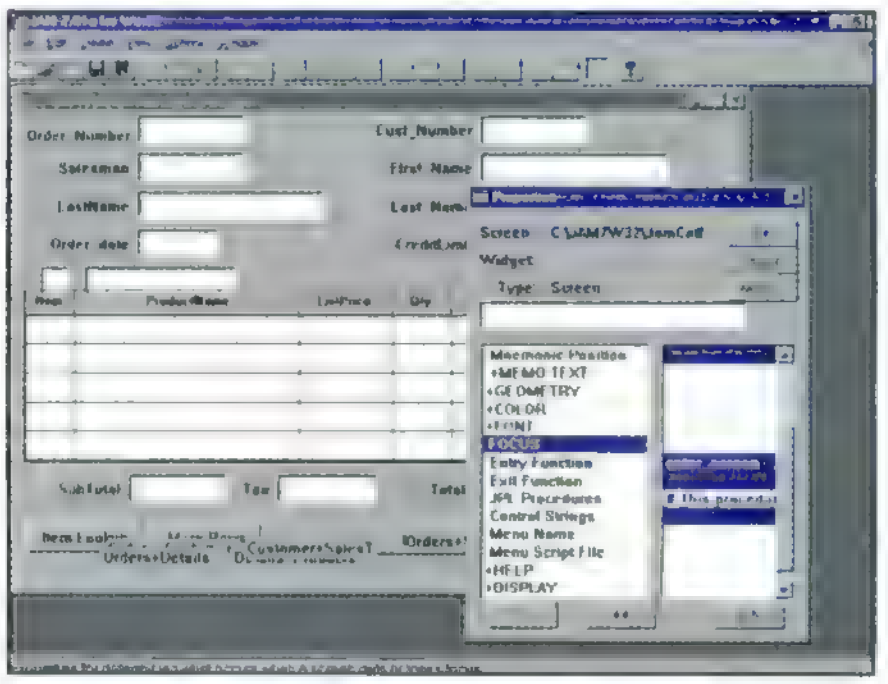
JAM WEB Toolkit 1.0

JYACC's JAM is a veteran client/server development tool that specializes in cross-platform development and deployment. With a diverse line that includes versions for Macintosh, Motif, OS/2, and Windows, JYACC is now taking the first step toward supporting the Web as yet another distribution platform. JAM WEB Toolkit 1.0 is the company's free add-on to JAM 7.01a ($2,400), but it will remain a short-term solution of limited capabilities until the company develops a dedicated Web tool.

ALMOST LIKE A LAN

Building a Web-based JAM application is not very different from building a LAN-based one; in fact, the only difference is the added care you need to take in designing your user interface. The JAM WEB Toolkit is an executable file that resides on the Web server and communicates with your Web server software through CGI. It acts as an intermediary between the Web server and standard JAM screen files.

When you build a JAM application, your screens are stored as .JAM files; the toolkit accesses these same screens and translates them to HTML when a request is received. This simple approach makes your JAM application immediately Web-aware but does not address the issue of state, security, or connection management. Each time the Web server receives a request for a JAM form, the full executable is launched, any database transactions are executed, the screen is sent to



In JAM, the Properties window organizes properties by categories into an expandable tree.

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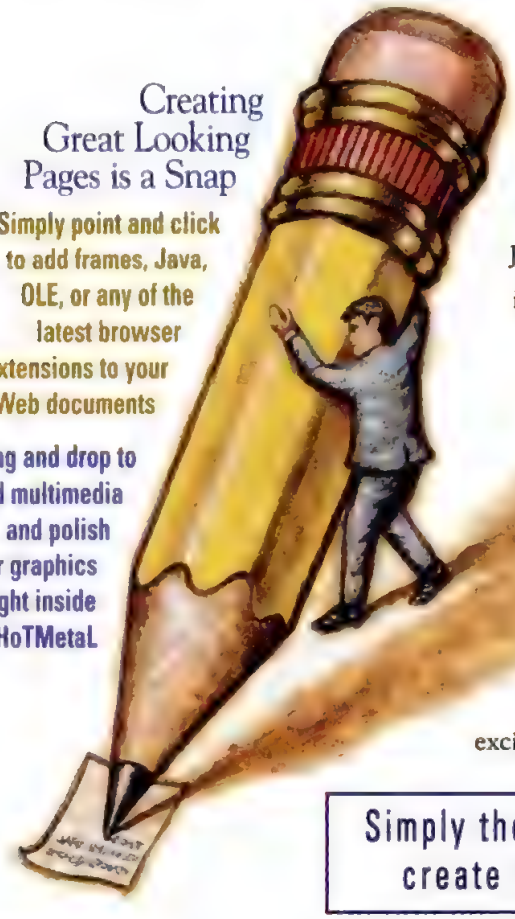

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TESTING FOR THIS STORY

Web Database Tools

Web database development is a brand-new field, and with a few notable exceptions, our tests found current development tools to be correspondingly immature. Many are traditional client/server tools with Web connectivity bolted on as an afterthought, a practice that reflects the frenzied growth of the Web tools market.

Nonetheless, a few of the tools offered impressive solutions to the specific problems of Web development, including the challenge of interface programming using simple HTML resources, the need for layering state management on top of the stateless HTTP protocol, and the need for connection management to deal with unpredictable client loads. As our reviews indicate, many of the tools will soon appear in newer versions that will address their current shortcomings.

How We Tested

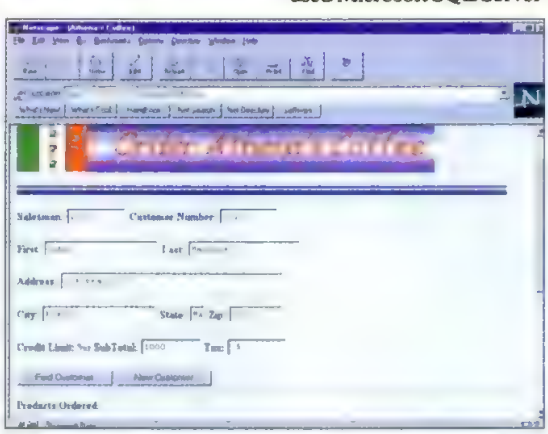
To test Web database development tools, we invited each vendor to come to PC Magazine Labs in New York for two days to work with our reviewers creating a sample Web database application. The test application employed such functionality as might typically be found in an application used by a mail-order business to sell products on the Web. The test script describes a catalog page, a master/detail order form, and several reports with graphs. The reporting portion proved to be problematic for most vendors, and if the product did not have a dedicated reporting tool, we skipped that section.

The test database underlying this application consisted of six tables: Products, Customers, Orders, Details, Salespersons, and Salestax. We generated the data using several custom Basic programs that produced random customer, order (with detail information), and salesperson data. The Salestax table was built from a U.S. government sales tax table picked up from the Web. In all, the data covered 10,000 orders, with up to 5 detail lines each, for 43 products distributed across 200 customers. The Salespersons table was joined to the Orders table through customers' home states. The catalog task in the test script specified a simple form with which users could query the product table for a specific product or price range. We required the page to indicate, when a product is found, whether the item is in stock.

The order form task, while relatively easy to implement in a traditional LAN-based client/server environment, proved difficult for some vendors. The order form required two entry points: "end user/new customer" and "sales person selling to existing customer." The application specified business rules: When a product is purchased, the product inventory is decremented; new customers get a maximum credit limit of $100; customers cannot purchase over their credit limit. We asked all vendors to restock as product levels drop below a specific level based on values we provided in the product table.

The physical network we used for testing was an intranet consisting of a Web server, a database server, and two clients. Our servers were Micron Electronics P133 Millennia systems with 32MB of RAM and 2GB hard disks running Microsoft Windows NT Server 3.51 with Service Pack 3. For the database server, we used Microsoft SQL Server 6.0; for the Web server, we gave the vendors a choice of using Netscape FastTrack 1.0, Netscape Communications Server, O'Reilly's WebSite 1.1, or Microsoft Internet Information Server (IIS) 1.0. For ease of setup, most chose to use IIS or WebSite.

Each client system was a Pentium-based HP Vectra XU 5/90C. One was equipped with 32MB of RAM and one with 16MB; both were running Microsoft Windows 95. The 32MB system was used as an application development platform, except in cases where the vendor preferred to run on the server. The 16MB system was used exclusively for accessing the application, via a browser.—*Jay Munro*



Our test app modeled the type of transaction-oriented functionality needed for a Web-based sales business.

the user, and the executable is exited. This brute-force approach is clearly not suitable for a high-traffic site, but it may serve as a stopgap measure for organizations looking to make internal applications immediately accessible from the Internet.

JAM is a robust development system that includes an interesting mix of programming metaphors and techniques. The user interface design is object-oriented, and coding is event-driven, but the programming language, JPL, is procedural. JAM contains a central repository that can contain screens and data-bound UI controls called widgets. These can serve as base objects for building your applications. You can inherit a widget simply by dragging it from the repository window to your new screen.

The repository lets you make certain changes to the parent object and have those modifications automatically applied to any derived objects in your application. When you work with objects in a JAM screen, you use the Properties window to change its characteristics. The Properties window organizes properties by categories into an expandable tree. The dialog automatically highlights any properties you have changed from the object's parent ob-

SUITABILITY TO TASK

JAM WEB Toolkit

	Power	Ease
Interface development	Poor	Fair
Database connectivity	Poor	Excellent
Application partitioning	N/A	N/A
Database development	Good	Fair

N/A—Not applicable: The product does not support this feature.

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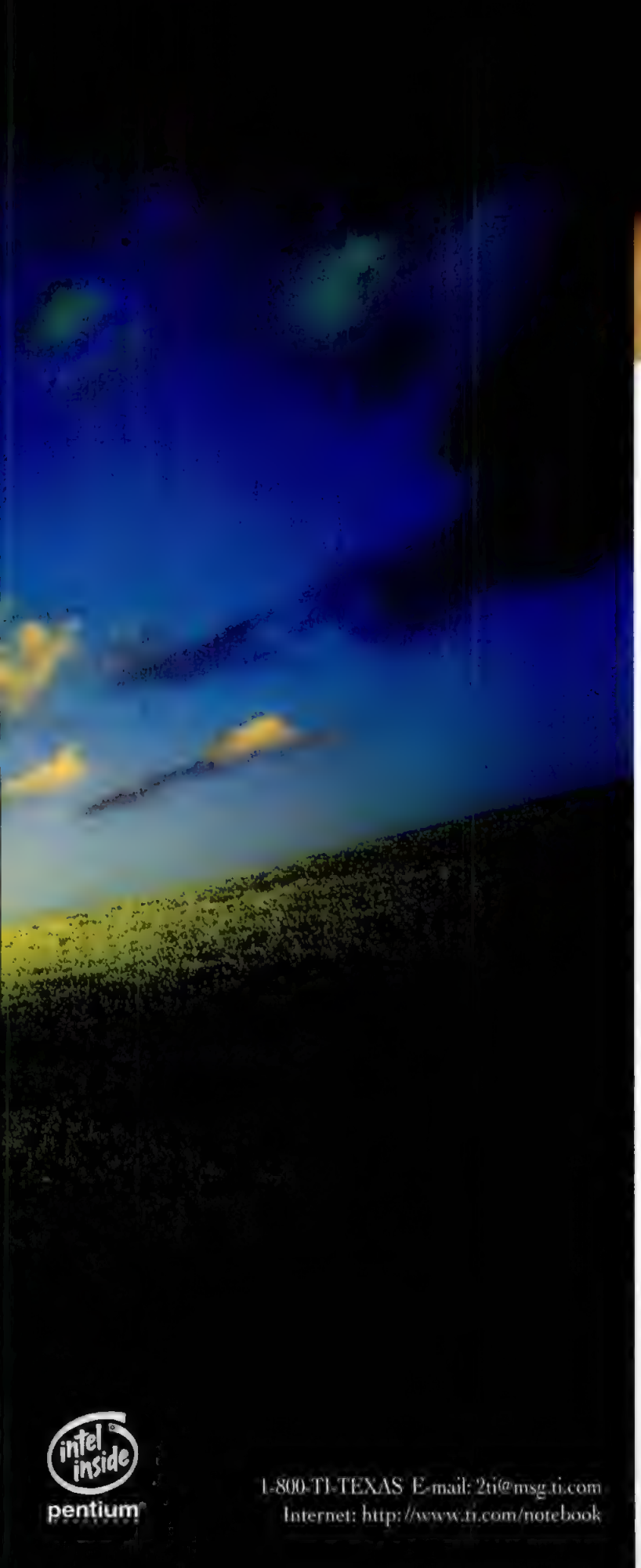

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TEXAS INSTRUMENTS

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ject in the repository, a nice time-saver if you're debugging unexpected behavior.

While JAM implements inheritance visually with widgets, it nevertheless is a decidedly code-intensive environment. JPL has a syntax similar to C and can be used in a number of different ways. You can attach JPL code directly to widgets; the code will execute when the widget is validated, either by tabbing out or by a mouse click. This type of code is saved in a compiled state within the screen binary. You can also write JPL modules in external text files and link them to screens or widgets as validation modules, or you can call them from any other module. These external modules get compiled when the application runs. If you have existing routines of business rules, you can also override standard event behavior by writing hook functions in C or another programming language.

One of the nontraditional aspects of JAM is its break from the typical properties-and-events implementation. Although there are numerous properties you can easily set for each widget, writing code to handle events is less than straightforward. Code attached to widgets is executed only at validation time and not, for instance, during focus changes. There are Entry Function and Exit Function properties that handle focus changes, but they must refer to procedures in screen modules or external modules, not in widget modules.

During testing, we found JAM to be productive and flexible in some areas but frustrating in others. JAM automatically created a repository from our SQL Server database that included basic entry screens and fields bound to each column. That meant we didn't have to connect each screen object explicitly to a data source; we simply dragged them from the repository to a new screen. We also liked the way JAM lets the developer access databases at any level, from the database API to the product's high-level abstraction layer, the Transaction Manager. For our test application, we worked primarily with the SQL Executor, an intermediate layer that allows the use of direct SQL commands. When it came to reporting, we were slowed by lack of a centralized graphical query manager in ReportWriter, the company's optional reporting product.

Fine-tuning our Web screens was a process of trial and error. While we built and tested our application first as a traditional client/server application, we took care to follow the special rules defined in the JAM WEB Toolkit's release notes. Because of the stateless Web environment, there are several differences between the way user interface controls act on a LAN and the way they act over the Web. Despite our careful efforts, there were still some placement and behavior surprises. Although the toolkit will translate any existing screens, many JAM developers will have to tweak their screens to make them suitable.

> One of the most significant challenges facing developers is the stateless nature of the Web's HTTP protocol.

To handle the toolkit's stateless nature, we used JAM's standard Send and Receive commands to pass data back and forth through HTML. Send and Receive—JPL commands designed to pass data between screens—allowed us to get around the state problem to a degree, but it was a tedious process.

Your JAM application will run under any of the product's target platforms unchanged, a major plus if you're responsible for coding for a highly heterogeneous organization. JAM and the JAM WEB Toolkit can also work with BEA Systems' Tuxedo OLTP product to create a three-tiered distributed application. This configuration makes load balancing and distributed execution possible. JYACC is working on a Web-specific solution for release later this year that will use native Web server APIs and offer more precise control over HTML screens. But as it stands now, the JAM WEB Toolkit is a quick-and-dirty way to get your existing JAM applications onto the Web.—*SWP*

JAM WEB Toolkit 1.0. List price: Free (requires JAM 7.01a, $2,400). JYACC Inc., New York, NY; 800-458-3313, 212-267-7722; fax, 212-608-6753; www.jyacc.com. *Circle 460 on reader service card.*

Spider Technologies Inc.

NetDynamics

PC MAGAZINE EDITORS' CHOICE

While many Web development systems offer partial solutions cobbled together from LAN-based tools, NetDynamics from Spider Technologies is a complete, dedicated, standards-based Web system right down to its HTML documentation. NetDynamics uses Java as its development language and server-side application platform, making it one of the most ambitious Java implementations to date. It also has built-in distributed application support, HTML wizards, database connectivity, and excellent state management. Altogether it is one of the most flexible and powerful solutions for serious Web development.

TOOLS AND SERVER COMPONENTS

NetDynamics comprises the NetDynamics Studio, a GUI development environment, and the NetDynamics application server. The NetDynamics Studio shows your project as a tree with branches for page templates, DataSources, DataObjects, and SecurityObjects. As you add items to your projects, wizards guide you through setting parameters and then generate Java code automatically. From there, you customize the properties of the items in your project with the Inspector window and add any application-specific Java code to standard or user-defined events. Unlike many other products, the application server is not merely an interface between the Web and database servers. The NetDynamics application server is a robust system of its own that provides an extensible architecture to handle database access, load balancing, and session management. It includes several components: multiple application servers and data servers, separate request brokers for application and database requests, a Session Monitor, and a System Monitor.

SUITABILITY TO TASK

NetDynamics

	Power	Ease
Interface development	Excellent	Excellent
Database connectivity	Excellent	Good
Application partitioning	Excellent	Good
Database development	Good	Good

Each application server process in-

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SUMMARY OF FEATURES

Web Database Tools

■ YES ▩ NO Products listed in alphabetical order	Delphi Client/Server Suite	4D Web SmartServer	HahtSite 1.0	JAM WEB Toolkit 1.0	NetDynamics 2.0
List price	$1,999.95	$1,195.00	IDE, $995.00 per user; engine, $2,495.00 per CPU	Free (requires JAM 7.01, $2,400.00)	$1,295.00
General Features					
Graphical IDE	■	■	■	■	■
Standard language/4GL/True object-oriented language	■ ▩ ■	▩ ■ ▩	■ ▩ ▩	▩ ■ ▩	■ ▩ ■
Web/LAN application deployment	■ ■	■ ■	■ ▩	■ ■	■ ▩
Nonprogrammers can maintain text and graphics	■	■	■	■	▩
Supports plug-ins or helper applications	■	■	■	▩	■
Supports Java/ActiveX	▩ ■	■ ▩	■ ■	▩ ▩	■ ▩
Pure Java applications on client/server	▩ ▩	▩ ■	▩ ▩	▩ ▩	▩ ■
Supports multitiered applications deployment	▩	▩	▩	■	■
Application Server Platforms Supported					
Macintosh	▩	■	▩	■	▩
OS/2	▩	▩	▩	■	▩
Unix	▩	▩	▩	■	■
Windows NT/Win32s	■ ▩	■ ■	■ ▩	■ ■	■ ▩
Database Connectivity and Session Management					
Supports CGI/NSAPI/ISAPI	■ ■ ■	■ ▩ ■	■ ▩ ▩	■ ▩ ▩	■ ■ ■
Includes native/ODBC database drivers	■ ■	▩ ■	▩ ■	■ ■	■ ■
Application preserves intrasession information (page by page)	▩	■	■	▩	■
Application preserves intersession information (between log-ons)	▩	■	▩	▩	■
User load managed by dedicated middleware	■	▩	▩	▩	■
Enforced page sequence	■	▩	▩	▩	■
Timed session expiration	▩	▩	■	N/A	■
Can map Web authentication to database authentication	▩	▩	▩	▩	■
Applications Development					
Wizards for common development tasks	■	▩	■	▩	■
Comes with integrated/bundled HTML editor	▩ ■	▩ ▩	■ ▩	▩ ▩	▩ ▩
HTML generation via screen painter	▩	■	■	■	■
Graphical query builder	■	■	■	▩	■
Automatic field creation from database	■	■	▩	■	■
Heterogeneous joins/updates	■ ■	■ ■	▩ ▩	■ ■	■ ■
Can create scheduled queries	■	▩	▩	▩	▩
On-the-fly application syntax checking	■	■	▩	▩	▩
Integrated version control	■	▩	▩	▩	▩
Integrated third-party hooks	■	■	■	■	■
Developer security levels	■	■	▩	▩	▩
Wizard-based applications deployment	■	▩	▩	▩	■
Complex HTML reports	▩	▩	▩	▩	▩
Debugging					
User can test in development environment	■	■	■	■	■
Interactive debugger	■	■	■	■	▩
Breakpoints/Watch points/Watch variables	■ ■ ■	■ ▩ ▩	■ ■ ■	■ ■ ■	▩ ▩ ▩
Step/Trace	■ ■	■ ■	■ ■	■ ■	▩ ▩
Remote debugging via the Internet	▩	▩	■	▩	▩
Help and Documentation					
Online help/Context-sensitive help/Full documentation online	■ ■ ■	■ ▩ ■	■ ■ ■	■ ■ ■	■ ■ ■
Web-based help	▩	▩	▩	▩	■
Language help/SQL syntax help	■ ■	■ ▩	■ ▩	■ ▩	■ ▩
Technical Support					
Free/fee-based technical support	▩ ■	▩ ■	■ ■	■ ■	■ ■
Toll-free/900-number technical support	■ ■	▩ ■	▩ ▩	■ ▩	▩ ▩
Web/BBS/e-mail support	■ ▩ ■	■ ▩ ■	■ ▩ ■	▩ ▩ ■	■ ■ ■
Support contracts available	■	■	■	■	■

N/A—Not applicable: This program does not maintain open sessions. * Viewing capability only; no write access.

VisualWave	WebGalaxy 1.0 Information Edition	WebObjects Enterprise 2.0
$4,995.00, Database Connect, $495	$5,000.00	Development license, $4,995; deployment license, $24,995

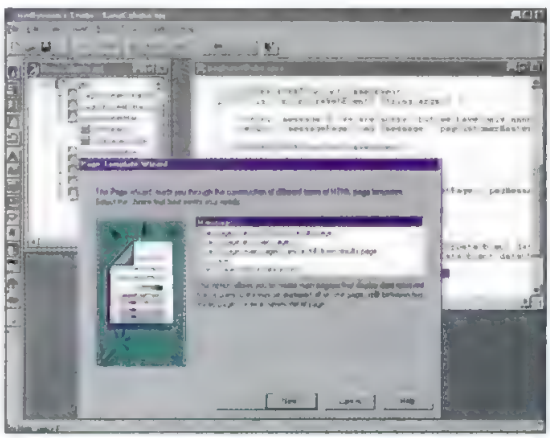
cludes its own Java virtual machine for executing your application, while the data server takes care of the connection to a database. The request brokers handle the application traffic and distribute it among the various data and application services.

The NetDynamics application server typically resides on the same Windows NT, Windows 95, or Unix machine as your Web server, but individual application and data services can sit on multiple machines; the components communicate via TCP/IP. A separate System Monitor process running on each machine can automatically restart processes or even the entire machine. NetDynamics works with CGI, NSAPI, and ISAPI. You can use any CGI-compliant Web server, but options for the Netscape and Microsoft servers are better documented than others. Although the NetDynamics server works natively with Informix, Oracle, and Sybase, the Studio must use 32-bit ODBC drivers for its connections. One of the most interesting aspects of the NetDynamics architecture is its ability to cache database connections. Persistent connections can be shared among multiple users to avoid the performance hit of opening and closing connections for each request.

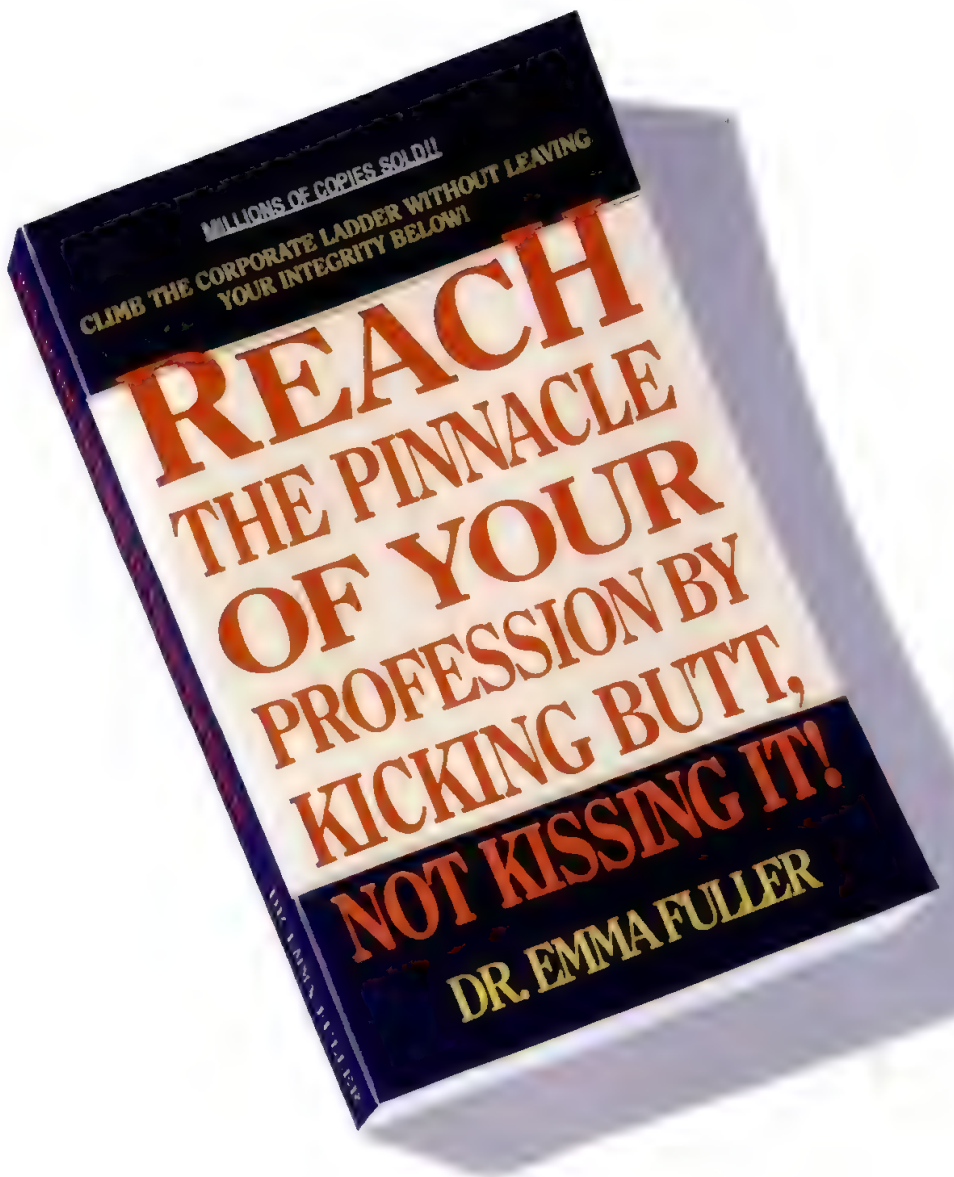
> While LAN developers can exploit a client machine's processing power and windowing system, Web developers must work within the limitations of the HTML standard.

NetDynamic's security features are as sophisticated as those of any product we tested and should be able to handle most real-world requirements. In addition to Web and database server authentication, NetDynamics offers page-level navigation flow, and mapped database authorization. By using a NetDynamics security object, you can associate permissions like read, write, or insert, or user group levels, such as User or Admin. You can also use a security table to map external user names and passwords to those stored in the database server. By doing so, you can avoid transmitting this information across the Web and even hide the real database log-on information from the end user. Lastly, you can control the flow of a Web application by assigning Previous Page properties to any page template and defining certain pages as start pages. The advantage here is that you can programmatically control where a user enters your application.

NetDynamics also does a fine job of maintaining session information. When a user loads the first page of an application, the server creates a session object. The Session Manager component in the application server maintains session and state information for each user until a developer-defined timeout occurs or an Exit Application command is executed. You can also create persistent objects that maintain their state during a session. A session identifier, created using the IP address of the client and a generated value from the server, is encrypted and embedded as a hidden field in each HTML page sent to the user. If the user then submits a form or executes a hotlink, that ID is sent back to the server in the URL, raising the appropriate active session. This ID changes from page to page, so the server always knows where the user is in an application and where he or she should be allowed to go next. The Session Manager also maintains database cursors for each session, so you don't have to worry about unpredictable retrieval order.



HTML wizards in NetDynamics Studio significantly ease the work of creating data-driven pages.



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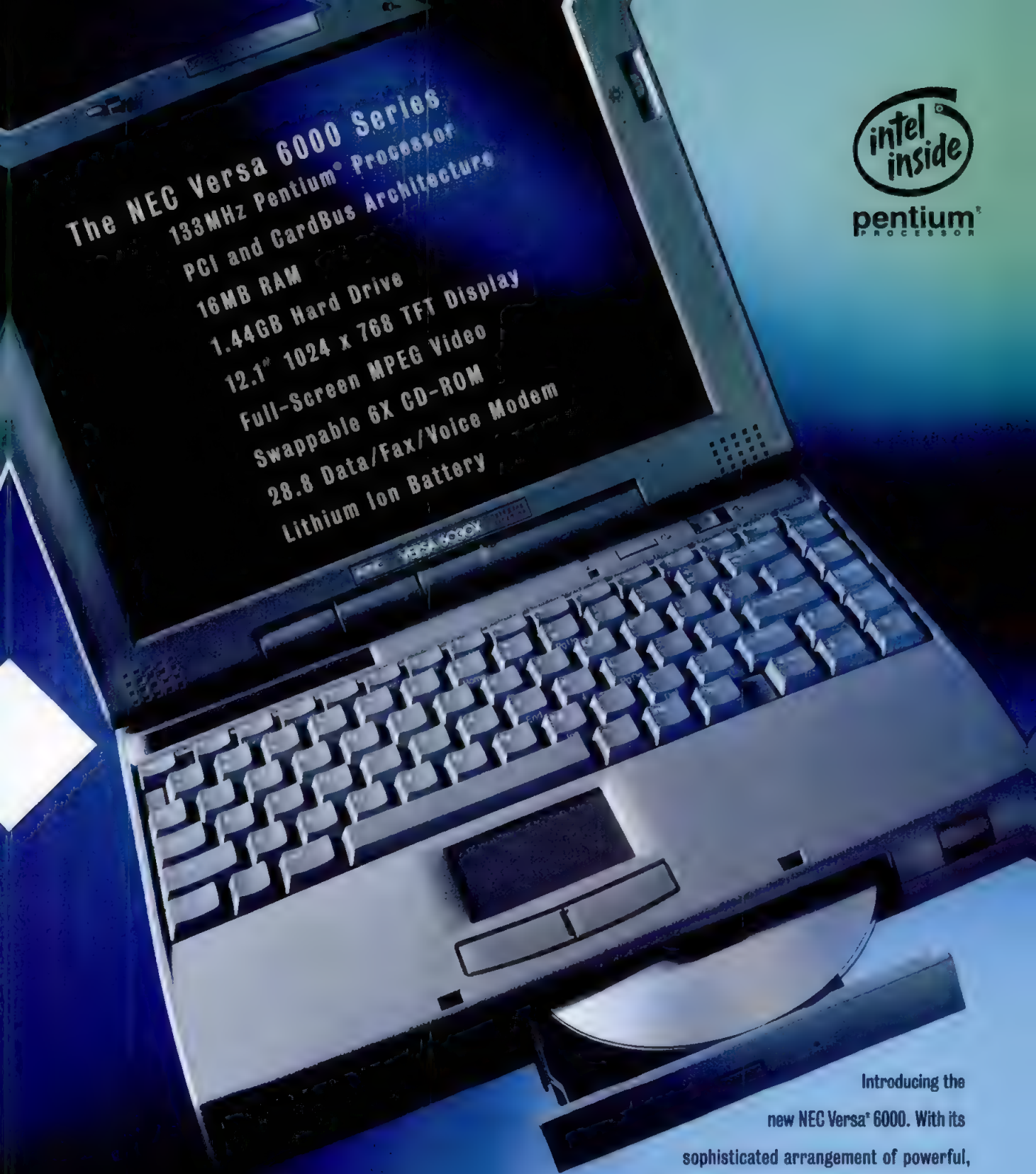

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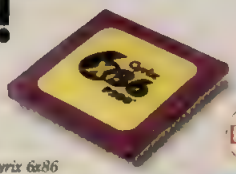

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- MS Windows® 95 pre-loaded w/Plus Pack
- 3-year limited system warranty

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Cyrix 6x86-P166 PC
Option II

- Cyrix 6x86-P166+ processor, 256K synchronous pipelined-burst cache
- 16MB Performance EDO DRAM (256MB max)
- 2.5GB EIDE hard drive, 3.5" floppy
- Matrox® MGA™ Millennium video, 2MB WRAM
- 8X EIDE CD-ROM drive
- Sound Blaster AWE32™ wavetable sound
- 17", 1280NI, .26mm monitor
- Hi-fidelity multimedia speaker system w/subwoofer
- 28.8 fax/modem/telephone answering device
- Minitower or desktop case
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- 3-year limited system warranty

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Cyrix 6x86-P150 PC

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- 16MB Performance EDO DRAM (256MB max)
- 1.6GB EIDE hard drive, 3.5" floppy
- 64-bit PCI video, 2MB 45ns EDO DRAM
- 8X EIDE CD-ROM drive
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- Minitower or desktop case
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- CompuServe CD – Trial membership
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- 3-year limited system warranty

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Yes NetWare

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CIRCLE 343 ON READER SERVICE CARD

FLYING THROUGH TESTING

Our test application was right up NetDynamics' alley. The Studio's wizards quickly stepped us through the process of building our pages and DataObjects, such as queries. The page template wizards proved very suitable for database applications. The DataObject wizard took us through the entire process of creating queries: There were steps for establishing computed columns, creating joins, generating Where clauses, and defining groupings. In the end, the resulting SQL statement was available for manual modification, but no SQL knowledge was necessary to design the queries. We easily added user interface elements such as labels, fields, buttons, and check boxes, and we modified their properties with the property/event dialog called the Inspector window. In addition to the standard events created for each object, we added several custom events for our application. When we typed a new event name into the Inspector window, a blank method of the same name was automatically added to the Java class for the current page. The Studio includes a built-in code editor and lets you launch your favorite browser, HTML editor, and text editor directly from the environment. Like most of the other products reviewed here, NetDynamics does not include any specific reporting features, although we found the DataObject wizard sufficient for basic reporting tasks.

> What state information an application maintains and how smoothly it makes it available to the developer are big considerations.

NetDynamics is robust today and clearly has a bright future. Its scalable design and excellent state- and session-handling capabilities make it perfect for heavy-duty Web applications.—*SWP*

NetDynamics 2.0. List price: $1,295. Spider Technologies Inc., Menlo Park, CA; 415-462-7600; fax, 415-617-5920; www.w3spider.com. *Circle 461 on reader service card.*

ParcPlace-Digitalk Inc.

VisualWave

ParcPlace-Digitalk's VisualWave 1.0a is a high-end, cross-platform Smalltalk development environment based on ParcPlace's VisualWorks, one of the industry's major Smalltalk dialects and development tools. Currently, VisualWave is available for Digital Unix, Digital NT, HP/UX, IBM AIX, Microsoft Windows 3.*x*, Windows 95, Windows NT, Sun Solaris, and SunOS. (Other VisualWorks operating systems mentioned in the VisualWave documentation, such as Mac OS and OS/2, are not supported at this writing.) The VisualWorks architecture lets you develop an application on one platform and deploy it on another without modification.

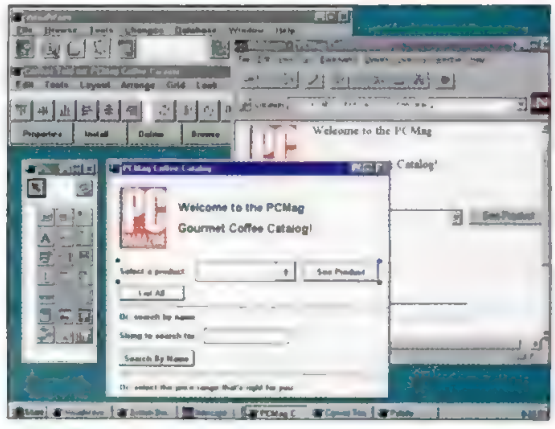
SUPERSET OF VISUALWORKS

VisualWave is a framework of classes and tools added to VisualWorks that convert VisualWorks applications into Web applications. It converts each application window into a separate HTML form by mapping the application's widgets to an equivalent HTML construct and then sending the resulting HTML code directly to the browser. One of the advantages of this approach is that you can port existing VisualWorks applications to the Web with little modification, and you can use the rich VisualWorks tool set to produce industrial-strength new Web applications. The VisualWorks development environment includes image and menu editors, a Canvas tool and widget palette for painting GUIs, several Smalltalk browsers and editors, a full-featured debugger, and runtime packaging facilities. A Database Connect add-on package ($495 per driver) is required for connecting to Sybase, Oracle, or IBM DB2 databases (the next release will also support ODBC data sources.) Team development/version control tools are also available separately.

In addition to the core VisualWorks tool set, VisualWave provides a Web server console, an HTML editor, a hot-regions editor for building image maps, and code for embedding Java applets. VisualWave also includes a personal HTTP server that runs within the Smalltalk image; you can use it for testing your applications.

Since Smalltalk is a dynamic binding language, you can develop, test, debug, and modify running applications without having to bring down the server. This can be a tremendous time-saver, since generating an interface suitable for a variety of browsers is a trial-and-error process at best. Assuming you are running an operating system that supports multiple sessions, you can develop your interface in VisualWave in one session and watch the effect on several Web browsers at the same time.

Although the personal HTTP server eliminates the need for a commercial Web server in many instances, it has some limitations. It can work only with items that exist in the Smalltalk image, so it cannot serve documents from the file system in response to browser requests. It also has no security features. For robust applications, you will want to use a commercial Web server, but unfortunately, the facility for running VisualWave applications this way is sold separately.



VisualWave lets you paint screens inside one session and browse the results in another.

SOMETHING LOST IN TRANSLATION

The downside of converting VisualWave applications to the Web is that a lot gets lost in the translation. HTML formatting capabilities are much more limited than VisualWave's, so the tools promise much more than they can deliver. Some items not supported in HTML, however, can be presented as image maps. Menu bars, for example, are repositioned vertically and

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Cache External	256KB Write Back (optional)	256KB Write Back	256KB
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Video Graphics	PCI Local Bus	PCI Local Bus	Matrox MGA Millennium
Diskette Drive	3.5" 1.44MB	3.5" 1.44MB	3.5" 1.44MB
Expansion Slots/Drive Bays	5/5 Desktop	5/5 Desktop	5/5 Minitower
Ports: Serial/Parallel	1/1 (ECP)	1/1 (ECP)	1/1 (ECP)
Security Features	Yes	Yes	Yes
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CIRCLE 310 ON READER SERVICE CARD

Sybase Development Tools and the Internet

By Mark Childers

Sybase's Powersoft division chose not to participate in this review because a number of planned Internet enhancements to its core PowerBuilder and Optima++ products were still in beta during our testing. A preview of these tools suggests that Powersoft is putting together a well-rounded suite that will address client/server Web development on a variety of fronts while leveraging existing PowerBuilder applications. The new releases, PowerBuilder, Version 5.1, and Optima++, Version 1.1, are slated for the third or fourth quarters of this year.

PowerBuilder 5.0, which shipped this spring, already introduced the capability of outputting a DataWindow or DataStore as HTML.

DATAWINDOWS ON THE WEB

One of the most important ways the company will bring data-oriented client/server functionality to the Internet is by extending the browser's capability through Netscape Navigator plug-ins and Microsoft ActiveX controls. The most significant of these will be the PowerBuilder Window Plug-In (which will also be implemented as an ActiveX control). This will let a PowerBuilder developer take a PowerBuilder window that has been developed for a LAN-based client/server application and drop it into a Web browser as a completely operational window for both viewing and editing data.

An additional control, the DataWindow plug-in, will give the browser the ability to read and display a Powersoft report format (.PSR) file generated from either a PowerBuilder or an Optima++ application. This file contains the formatting information as well as the retrieved data. When completed, both the PowerBuilder Window and the DataWindow will be available for free download from the Powersoft Web site.

Powersoft's recently acquired component division, Visual Components Inc., will deliver additional ActiveX controls designed to provide basic Internet functionality for existing applications. A browser control will let developers add a fully functional Web browser to applications. Additional controls will let you incorporate FTP functionality or let you control the behavior of standard browsers such as Netscape Navigator or Microsoft Internet Explorer through your application. These controls can be used in PowerBuilder or Optima++ applications, or in any development tool supporting the ActiveX standard.

> Create windows and DataWindows for LAN-based applications and run them in your browser with little or no modification.

OPTIMA++

Optima++, Powersoft's C++-based RAD tool, will soon support the creation of Java applets using the same visual tools currently used to generate C++ applications. You will be able to create your forms visually and use the Reference Card wizards to fill out functions and events. Optima++ will eventually include a DataWindow control that will match the functionality of PowerBuilder's native DataWindow.

APPLICATION SERVERS

In addition to the aforementioned methods of delivering Web-based client/server applications, Powersoft is also offering distributed Web application server development with Optima++ and PowerBuilder.

With the use of a distributed PowerBuilder application server, a Web page can easily issue a request to execute a retrieval on a DataStore (a nonvisual DataWindow) stored in a distributed server. This in turn can return either an HTML file to the browser or a .PSR file for display via the DataWindow Viewer Plug-In. You can save a DataWindow or DataStore output as an HTML file. This also lets you do complex scripting and calculations not normally done with HTML. In addition, it provides for a scalable solution as the application grows, and it greatly simplifies the distribution of code. There's no need to send out a new executable when a new column is created on the DataWindow. Communication between the Web server and the Powersoft application server is accomplished through CGI or via the Web server's native API (NSAPI/ISAPI).

Optima++ can also be used to create application servers that interface to the Web server with the native API. These are created as .EXE or .DLL files and interface directly with the Web server. Borland International's Delphi Client/Server Suite has a similar implementation. Powersoft plans to enable Optima++ to create distributed application servers similar to PowerBuilder.

All of these options give a developer some flexibility when implementing a client/server Web application. If you don't want the user's browser to require a plug-in, you could code a distributed Optima++ or PowerBuilder application called through a CGI, NSAPI, or ISAPI, ultimately returning the results to the Web browser in HTML format. On the other hand, if presentation, flexibility, and reusability are requirements, then creating a Window or DataWindow that returns results to the Window Plug-In or DataWindow Viewer can easily be accomplished.

Many development tools in the past have lacked the flexibility PowerSoft expects to provide. Bundling the ability to create windows and DataWindows for LAN-based applications and then running them from your Web browser with little if any modification will make lots of IS managers eager for Powersoft to get its product out the door.

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to the side of the window in a fully exposed, pulled-down format. But other unconvertible items, such as group boxes, are ignored. Several of the widgets on the palette are not supported by HTML, including combo boxes, data sets, and sliders; nor are options for aligning and fine-tuning their positions shown on the screen. That's a tease, and it puts the burden of differentiating what can or cannot be done on the developer.

SUITABILITY TO TASK

VisualWave

	Power	Ease
Interface development	Excellent	Good
Database connectivity	Good	Good
Application partitioning	Excellent	Good
Database development	Good	Fair

ParcPlace did hide some functionality, most notably the database tools, by removing items from menus and toolbars, but this was done haphazardly, suggesting a rush to get the product to market (the classes are still in the image and most of the documentation still refers to these items). Removing tools like the Data Modeler makes sense in one respect, since it produces data sets that are not supported, but functionality such as its ability to view a database schema should have been preserved. The result is that VisualWave comes off as something of a kludge, a pity since it is really a very powerful and capable tool.

KNOW YOUR SMALLTALK

Another problem with the product is one of positioning. Judging from the documentation, the targeted market appears to be experienced Web users who have little or no knowledge of Smalltalk. Actually, the targeted market ought to be Smalltalk programmers who have little or no knowledge of the Web. HTML is relatively simple, and all of the HTML code for very useful applications can be hidden from the developer. The Smalltalk development environment, on the other hand, is unavoidable. To produce even the simple application in the tutorial requires custom Smalltalk coding, and to take advantage of VisualWorks' strengths, particularly reusability of code and the ability to separate interface from domain and application components, you must learn about the model-view-controller (MVC) application framework on which it is based.

Ironically, the VisualWorks application framework was supposed to simplify development—and it does, when compared to the early days of Smalltalk development. But in order to use it, the developer has to understand a complex conceptual model and become fluent in the MVC vernacular of aspect adaptors, value models, view-controller pairs, and other abstruse constructs. The VisualWorks tutorial heroically tries to introduce this unwieldy material to the newcomer and does a fairly good job of presenting it, but it quickly gets into deep water. Stouthearted OOP converts will want to wade through it, but others may become discouraged.

You probably won't find a more powerful development environment than VisualWave, but its complexity and cost are enough to turn away developers who can find simpler alternatives for database Web applications.—*Gabrielle Gagnon*

VisualWave 1.0a. List price: $4,995; Database Connect, $495. ParcPlace-Digitalk Inc., Sunnyvale, CA.; 800-759-7272, 408-481-9090; fax, 408-481-9095; www.parcplace.com. *Circle 462 on reader service card.*

Allen Systems Group Inc.

WebGalaxy Information Edition

The most unconventional tool in this roundup, WebGalaxy 1.0 Information Edition from Allen Systems Group, is designed specifically to let nonprogrammers create interactive Web applications. Its strengths are not well suited to writing traditional database applications, and we found that debugging and maintenance present formidable obstacles for users.

At the same time, WebGalaxy has appealing features that may fit the needs of some Web developers very well. Under the covers, WebGalaxy is a Java-based system that is descended from a help-desk authoring tool. Its unusual origins help to explain both its strong points and its shortcomings.

SUITABILITY TO TASK

WebGalaxy Information Edition

	Power	Ease
Interface development	Good	Excellent
Database connectivity	Good	Good
Application partitioning	N/A	N/A
Database development	Poor	Poor

N/A—Not applicable: The product does not support this feature

NONTRADITIONAL TOOL

Instead of procedures and objects, WebGalaxy uses decision trees to represent program logic. Programming consists of graphically adding nodes to these trees to build *knowledge maps*. This model discards many of the conventions of both procedural and object-oriented programming. For example, you can create a subtree to simulate a function, but you cannot pass it arguments. Nor is there anything resembling objects, classes, or inheritance. And while many other tools let you build your own components and add them to the palette of available objects, WebGalaxy limits you to about a dozen basic node types. All this runs against the current tide of extensible, component-based RAD tools, whether on the Web or off.

The layout of the nodes determines the course of program execution. A Question Node, for example, lets the user enter a field value and branch to different paths according to the value entered. Action Nodes display text or other data. There is no report facility in this version of WebGalaxy; in order to create a report from a table, we had to write HTML statements manually. On the plus side, it was easy to insert a .GIF, sound, or video file. You can also attach multimedia objects to Help Nodes to assist users in navigating through your Web links.

Database connectivity is provided through ODBC Query Nodes, in which you design custom select or action queries by selecting tables and fields. Unfortunately, you have to build a SQL statement manually in order to join tables. Once you define a query, its data becomes available in the rest of your program. Finally, Conclusion Nodes provide summaries for the user and terminate each branch on your knowledge map tree.

Each type of node, except for those that are entirely nonvisual, use an HTML template that acts as a container for WebGalaxy Java applets. WebGalaxy offers full control of the HTML templates with which you display each step of your program. You can customize their look and feel, add graphics, and reuse them across projects.

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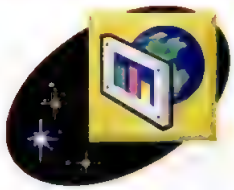

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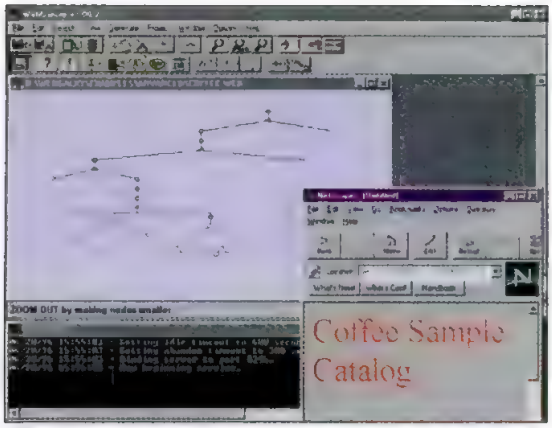


WebGalaxy's knowledge maps take the place of traditional programming logic.

The package does not provide an HTML editor and assumes you'll use a third-party tool. WebGalaxy applications are presented to the user as HTML pages with embedded Java applets; thus they require a Java-enabled browser.

Our testing script was clearly not suited to WebGalaxy's strengths. To create database reports, we had to build SQL statements manually and also write HTML code to generate tables dynamically. These are not tasks a nonprogrammer will want to tackle.

We were also frustrated by the lack of debugging facilities. Debugging must be done using a trace log from the server, which almost anyone will find daunting. Application maintenance is also a problem. Inserting a new node into a tree is a hazardous process, since you must first cut existing nodes to the Clipboard, insert a new node, and then paste the old nodes after it. If you can overlook these limitations, the design environment in WebGalaxy works quite well and proved quite stable.

CREATION AND DEPLOYMENT

There are two separate modules for creating and deploying WebGalaxy applications. The development module can be downloaded for free from the company's Web site. The 16-bit application runs a local copy of the Web server, letting you develop applications on a standalone workstation. The server module is available as a 32-bit Windows NT console application, as well as on a variety of Sun Solaris and SunOS flavors.

WebGalaxy offers no new twists to solving the stateless nature of Internet connections. All links are determined by your browser. In order to browse Web pages that use WebGalaxy, there is a recommended first step of loading local copies of the custom Java applets onto the local machine. Otherwise, WebGalaxy applications will be sluggish, since each form loads a new applet every time.

One potentially powerful feature of the product is WebGalaxy's ability to make system calls on the server end to other processes. Though a far cry from a formal *n*-tiered architecture, where application logic is kept separate from the front end and data access logic, this capability will let you leverage the power of existing applications from the server.

CASE-BASED REASONING

An alternative version of the product, WebGalaxy Knowledge Edition ($10,000 for the server module) includes WebGalaxy's Case-Based Reasoning module. To judge from sample applications on the company's Web site, it may be in this tool, rather than the ODBC-enabled WebGalaxy Information Edition we tested, that WebGalaxy's strengths appear to best advantage. Applications based on the Knowledge Edition can guide a user to answers based on natural language queries. The case-based reasoning facility is a legacy of WebGalaxy's heritage as an online help authoring system.

By adopting a do-it-yourself approach to developing Web-enabled applications, WebGalaxy attempts to open up Internet and intranet development to nonprogrammers. For certain types of Web applications this strategy can work, as long as debugging and maintenance remain manageable.

SUITABILITY TO TASK

WebObjects Enterprise

	Power	Ease
Interface development	Good	Good
Database connectivity	Excellent	Excellent
Application partitioning	Excellent	Excellent
Database development	Excellent	Excellent

If your needs are more in line with traditional form-based database applications that must be Web-enabled, you should definitely go elsewhere for now. But for building a whole class of potentially profitable Internet applications, WebGalaxy is a product to watch in the future.

—Richard V. Dragan

WebGalaxy 1.0 Information Edition. List price: Client module, free; server module: $5,000. Allen Systems Group Inc., Naples, FL; 800-475-7171, 941-435-2200; fax, 941-263-3692; webgalaxy.net. *Circle 463 on reader service card.*

NeXT Software Inc.

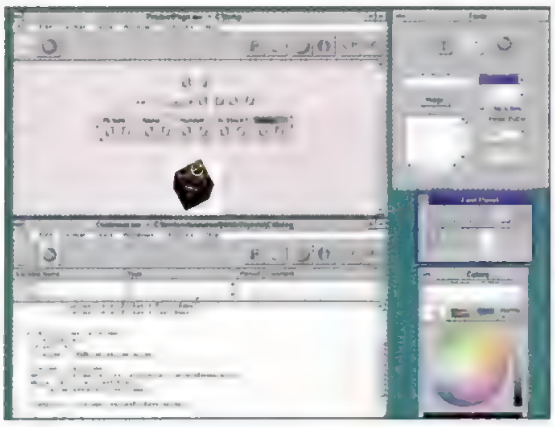
WebObjects Enterprise

In WebObjects Enterprise 2.0, NeXT Software has delivered a powerful solution for the Web founded on the company's tried-and-true object-oriented frameworks. Packed with objects, frameworks, support for transactions, load balancing, fault tolerance, distributed computing, industry-standard database servers, and a robust object-oriented language called Objective-C, WebObjects satisfies industrial-strength development needs. But be prepared to face a learning curve, the grade of which may depend on your previous experience with object orientation, when you begin using this software.

WebObjects is browser- and server-independent and runs on HP/UX, NextStep, Solaris, and Windows NT. It works with CGI, NSAPI, and ISAPI, and it can communicate with Java applets.

WebObjects applications communicate with Web servers via a Web Adapter. Upon receiving a request from a Web server (which may be local or remote), an adapter responds by forwarding the request to a designated WebObjects application. The WebObjects application that receives the request usually handles HTML documents containing <WEBOBJECT ...> tags, which are similar to Java applet tags but are recognized and replaced by a WebObjects application before being sent via the Web server to the browser. For load balancing, multiple copies of a WebObjects applications may be spawned on local or remote servers.

The product comes with more than 20 classes for handling HTML and more



The Web Objects Builder is a GUI tool for creating WebObjects and building HTML pages that contain them.

than 20 reusable WebObjects. Others are available on NeXT's Web site and through third parties. If you plan to add table-editing features to your Web pages, you'll enjoy using the CRUD (Create, Read, Update, and Delete) WebObjects.

It is also relatively easy to create your own WebObjects. The Web Objects Builder is a graphical tool that lets you build a WebObject's user interface (using HTML) and optionally supply code using either a scripting language called WebScript or Objective-C. WebScript is a simple language used to communicate with frameworks and to control other WebObjects. NeXT plans to support both JavaScript and VBScript in an upcoming release.

MODEL BUILDING

The Enterprise Objects Modeler (EOModeler) creates an object model and associates Enterprise Objects and properties with the tables and attributes of a relational database model. EOModeler, which itself is a WebObjects application, reads data dictionary information from Informix, Microsoft, Oracle, Quickbase, and Sybase database servers (third-party support is available for DB2 and Interbase) and lets you define mappings between your database and Enterprise Objects. The object model you create using the EOModeler is then used by the Enterprise Objects Framework in your WebObjects application.

With this approach, the work of translating relational data into an object-oriented form at runtime is done for you, and Enterprise Objects can be synchronized with corresponding database rows throughout the execution of an application.

Perhaps the heart of WebObjects is the Enterprise Objects Framework (EOF). The EOF is used to manipulate data as it passes between your database, your Enterprise Objects, and the HTML interface in your WebObjects application. The framework provides a valuable layer of abstraction for business logic. Your code talks to the framework, so that an application's interface or back-end database can be changed without having to alter business logic.

The EOF is not required for building WebObjects applications. The WebObjects Pro version of the product doesn't come with the EOF. Instead, WebObjects Pro allows you to talk directly with a database server using SQLKit.

Transaction processing is an integral part of the EOF, with sophisticated mechanisms for handling transactions that apply to database activity as well as business logic. When fetching information from a database server, one can use an EODatabaseChannel, by which the EOF starts and commits transactions automatically. You can gain further control over these transactions by using *delegates*, which act as transaction managers, deciding whether to reject, approve, or override a transaction based on programmer-supplied logic. The EOF also maintains a stack of actions that can be undone, if desired.

> CGI is not very elegant when it comes to memory management. NSAPI or ISAPI offer a more efficient way of connecting a Web server to a database.

WebObjects comes with a state-handling API and allows you to store state in WebObjects applications or in HTML pages. You can also use your own custom storage mechanism (in order to use Netscape cookies, for example). For applications, state is stored in an NSDictionary object. For pages, an application creates an NSData object whose ASCII representation is put into a hidden field on the HTML document. A stateID gets generated by WebObject applications during request-handling. The stateIDs have the format applicationInstance.sessionIdentifier.key.extension. The sessionIdentifier uniquely identifies each user session, the key is a randomly generated number, and the extension is incremented with every transaction, making the URL for each transaction unique. Custom storage mechanisms can be implemented by overwriting a few methods in one of the WOApplication objects.

WebObjects supports distributed object computing through NeXT's D'OLE software. D'OLE is the central intelligence for allowing objects to communicate across an enterprise. D'OLE allows Objective-C clients to communicate with OLE Automation Servers, and Objective-C servers to communicate with OLE Automation Clients. This means that values from an Excel spreadsheet could appear in an HTML page, and information from an HTML form could be transferred to a Visual Basic or Delphi application. D'OLE provides much of the functionality specified in CORBA and comes with NeXT's Object Request Broker, called NextORB. NextORB allows NeXT objects to communicate with OLE/COM components and will soon support the Internet Inter-ORB protocol (IIOP), allowing NeXT objects to communicate with CORBA 2.0–compliant ORBs from other vendors.

Overall, WebObjects is a very impressive product with a lot of depth. There is a good deal to understand before you set out to build something, but once you've got the theory behind you, the power of WebObjects can be quite handy. WebObjects has a very open architecture that is becoming even more open and is suitable for any large or sophisticated Web site.—*Joshua Kerievsky* □

WebObjects Enterprise 2.0. List price: Development license, $4,995; deployment license, $24,995. NeXT Software Inc., Redwood City, CA; 800-879-6398, 415-366-0900; fax, 415-780-3929; www.next.com. *Circle 464 on reader service card.*

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ILLUSTRATION BY JAMES O'BRIEN

The 1996 PC Magazine Shareware Awards

Forté's Free Agent Internet news reader takes top honors in this year's contest.

By Sheryl Canter

Each year, Ziff-Davis honors the year's best new or significantly upgraded shareware products. This year's awards, presented on June 27 at a ceremony held during the annual Shareware Industry Conference in Phoenix, Arizona, were sponsored by *PC Magazine, Computer Gaming World,* and ZD Net. *PC Magazine* editors judged nongame software in seven categories: Applications, Business & Finance, Internet, Math & Science, Networking, Programming Tools, and Utilities. You'll find the finalists and the winners of each category and instructions on

IN THIS SECTION

TUTOR An explanation of string-searching algorithms demonstrates the differences in program speed that can be achieved through changing a program's basic strategy. Jeff Prosise gives an account of the progress from the brute-force method of string searching to the far more efficient Boyer-Moore algorithm. He's also written a program demonstrating the latter that you can download from PC Magazine Online. *page 289*

INSIDE WINDOWS 95 What do you hate most about Windows 95? Chances are, the developers at Microsoft know what you can't stand and have already fixed it. If you download any or all of the PowerToys, you can tweak many aspects of the user experience. Read on to learn how to release some of the shackles Windows 95 places on users and to make it a better OS. *page 299*

POWER PROGRAMMING One source of frustration for users is having several unnecessary instances of the same program running at once. Here are four ways you can spare your users this annoyance in your Win32 programs: One uses the FindWindow API function, the second uses the global atom table, the third uses named mutexes or semaphores, and the last uses a DLL. Each method has its own advantages and disadvantages. *page 319*

INTERNET TOOLS Some of the most fervent debate and intelligent information sharing on the Internet is going on in Usenet newsgroups. Find out how they work from the standpoints of the news reader, the news server, and the Network News Transfer protocol. *page 333*

ALSO IN THIS ISSUE In PC Solutions, learn how to prevent ink jet–printed documents from smearing, approach problems with multimedia playback, get full functionality from your printer driver in Windows 95, solve a Winsock compatibility problem, get a new icon for OS/2 folder icons, do multilevel sorts in Word for Windows, enforce negative values for debit entries in Excel spreadsheets, and more. *page 339*

how to download the software in sidebars to this article. Another sidebar gives a brief description of each category's winner.

The overall winner of this year's contest is Free Agent, a feature-packed Internet news reader, from Forté. Forté uses a variation on the shareware marketing paradigm for its news reader, Free Agent, which is, as the name implies, free. For $29 (or $40 for a shrink-wrapped copy with a manual), you can obtain the enhanced version of the product, Agent. Some of Agent's enhancements include full send-and-receive e-mail capability, folders, sorting, multilingual spell-checking, and kill/watch lists.

Both Agent and Free Agent are online/off-line news readers. The off-line capability allows you to log on to a news server, download message headers, and then log off to sort through them and select the ones of interest. You can then log on again to retrieve the message bodies you selected, go off-line to read the messages and respond, then return online to upload your responses. The ability to work off-line distinguishes Agent from other news readers, such as the one included with Netscape Navigator 2.0.

THE CHALLENGE OF NEWSGROUPS

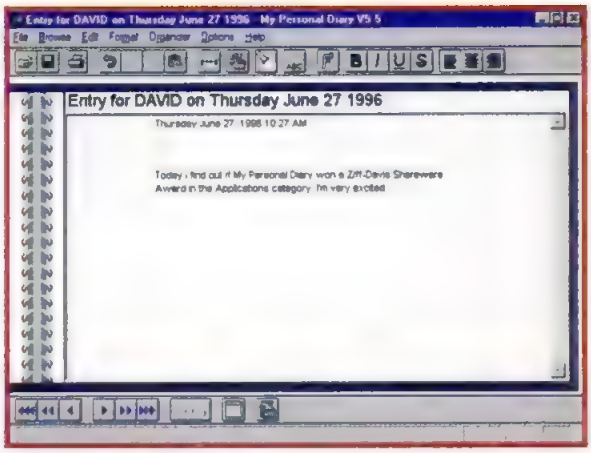
Network news is the oldest part of the Internet—and still the liveliest. Though the Web has popularized the Internet, it's newsgroups, not the Web, that's the source of government concern about pornography and censorship. The Web is actually pretty tame; newsgroups, with their threaded discussion format, are a free-for-all. Longtime Internet users feel that newsgroups are the heart and soul of the Internet. As Robert Maynard, CEO of Internet America (which offers a high-end subscription news service called Airnews, at *http://www.airnews.net*), says, "Novices surf the Web; power users read newsgroups."

But as the Internet has increased in popularity, news servers have become strained to the breaking point. The sheer volume of news, for example, is staggering: approximately 20,000 newsgroups exist worldwide. To carry a majority of these, a news server needs tens of gigabytes of hard disk space and hundreds of megabytes of RAM. And you, the user, need a news reader that won't break under the load. Airnews recommends Agent as the news reader of choice, because it can handle the unusually high volume of Airnews' news server without slowing down or crashing, as many other news readers will do.

Another challenge for such off-line news readers as Agent is dealing with the custom software used by news servers to handle that volume. For example, CompuServe deployed multiple news servers so that users logging in would be connected to whichever server was available. The problem for off-line readers was that the articles were numbered inde-

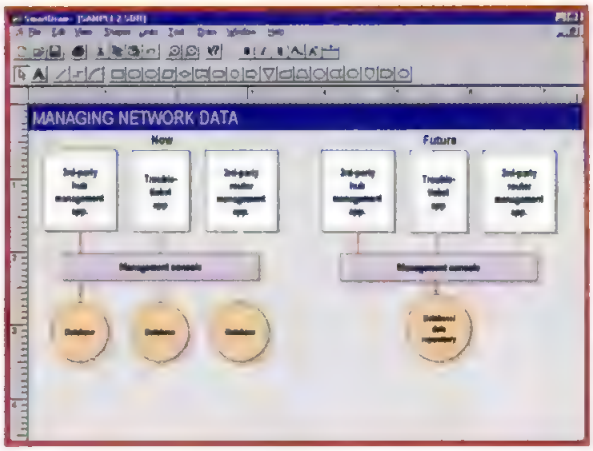
Winners' Circle: PC Magazine

APPLICATIONS



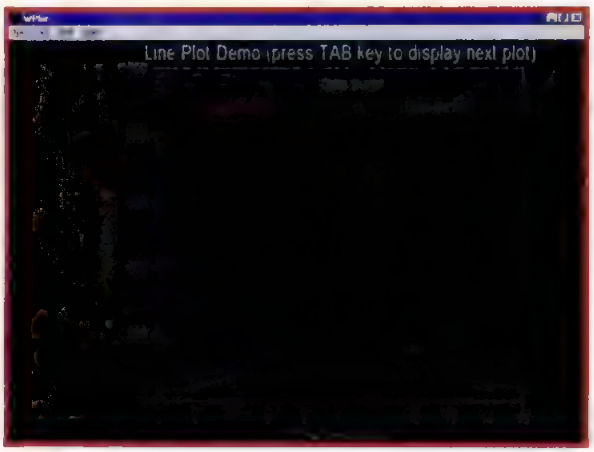
MY PERSONAL DIARY FOR WINDOWS 95 is a slick, well-organized package that lets you keep a journal or manage personal information. All entries can be password-protected and stored in encrypted files to ensure privacy. My Personal Diary's clean, word processor–like interface supports formatting for text and paragraphs, as well as for fonts, styles, and colors. You can enter up to 1MB of text for each entry, and you can search for text strings in entries or for entries by date.

BUSINESS & FINANCE



SMARTDRAW 95 FOR WINDOWS 95 OR NT is a state-of-the-art business-graphics package designed for people who need to produce flowcharts or diagrams, but whose last great drawings were posted on their parents' refrigerators. Although you can draw freehand with SmartDraw, you can generate most of what you need simply by dragging shapes from the toolbar into the editing window. These shapes are editable, so SmartDraw can adapt to your needs. Predrawn shape libraries and templates are also available.

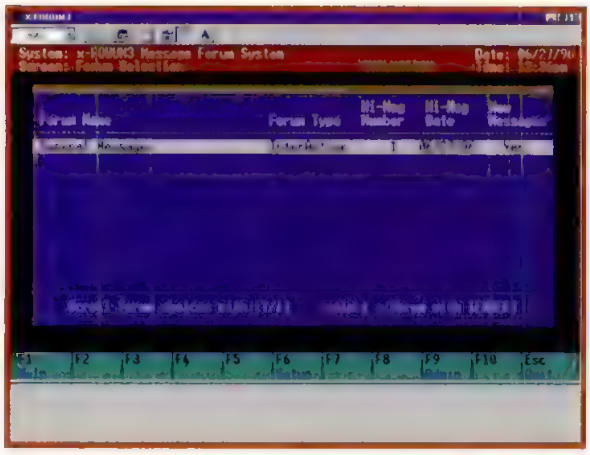
MATH & SCIENCE



WPLOT'S ease of use, versatility, and reasonable registration fee make it the best shareware graphing program for the Windows platform. You create 2-D and 3-D plots from up to 250 data sets per plot and up to 16,000 points per data set. Your options include choosing whether to use log or linear axes, adding labels, and selecting line, scatter, or histogram plots. You can fit curves to data or plot a Fast Fourier Transform. WPlot is a real shareware gem: It performs on a par with many commercial programs.

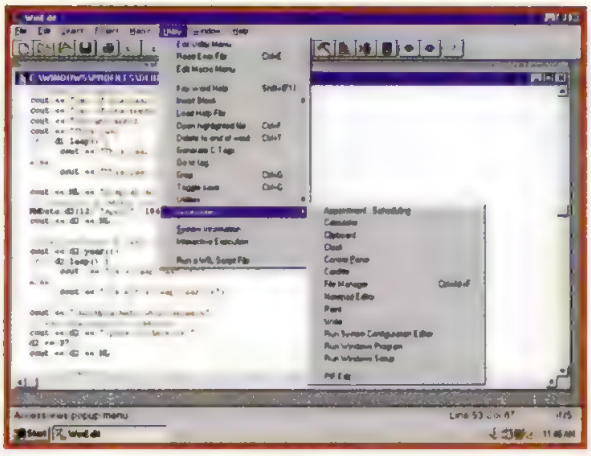
Shareware Award Recipients

NETWORKING



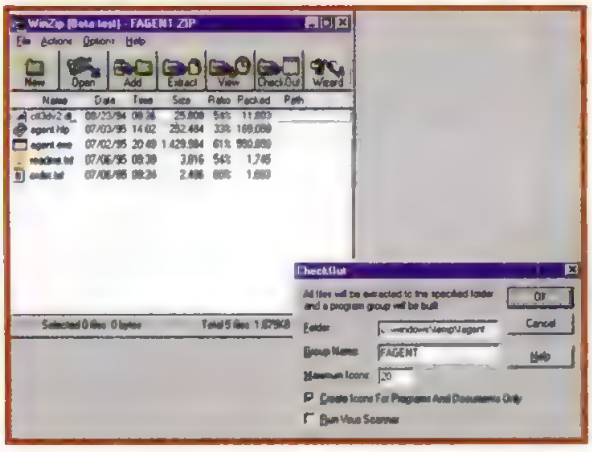
X-FORUM3 NETWORK MESSAGE FORUM is a public discussion program that allows users connected to a Banyan VINES or NetWare LAN to share ideas with other network users. X-Forum3 allows up to 26 different discussion conferences, which can be designated as interactive or read-only. X-Forum3 has a multilevel security system based on user accounts, and the administrator can appoint managers for each forum. Other features include new-message indicators for each forum and online help.

PROGRAMMING TOOLS



WINEDIT is a versatile, 16-bit Windows ASCII/ANSI programmer's editor. The downloadable copy includes the program's Lite, Standard, and Pro versions. The Lite version lets you edit files of any size. The Standard version lets you invoke your compiler directly from WinEdit; you can also view any resulting error messages. WinEdit features syntax color coding of source code, multiple views of the same file, and easy key-reassignment capability. The Pro version adds a complete and powerful macro scripting language.

UTILITIES



WINZIP FOR WINDOWS 95 is an impressive 32-bit drag-and-drop-enabled version of the popular file-compression program. WinZip can create and open .ZIP archives as well as archives in .ARC, .ARJ, and .LZH formats. You can view the multiple files in an archive without closing the first file, and you can check for viruses and make an .EXE file. Particularly useful is the Check Out feature, which lets you extract all files in an archive into a folder you specify and which then sets up a program group.

pendently on each server. So if Agent were to go online to retrieve the body of a particular message (identified by number) but happened to connect to a different server, the article wouldn't be found. Agent works around this problem by allowing users to log on to a specific server.

Although threaded messaging capability has started to appear on the Web, newsgroups still have notable advantages and are unlikely to disappear anytime soon. Whereas Web-based discussions are localized to a particular site, network news discussions are propagated throughout the world and are thus accessible to a much larger number of people. Also, no one owns network news; it can be very difficult—some say impossible—to remove some types of newsgroups. By contrast, Web sites can be yanked in a matter of seconds.

Discussions on network news are also much easier to locate than discussions on the Web. News servers let you obtain lists of all newsgroups and article headers in each group—a big advantage when you're trying to find discussions on a particular topic. There's no easy way to find a Web-based discussion group on a particular topic, because there's no way to know which Web sites even have discussion groups.

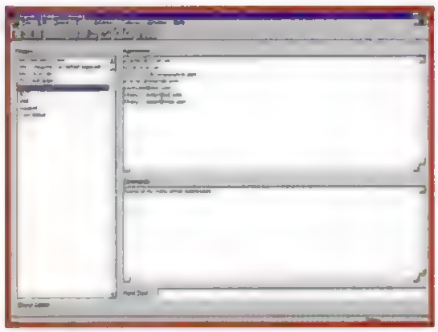


FIGURE 1: *Free Agent's three-pane window lets you simultaneously view a list of newsgroups, the messages the selected newsgroup contains, and the contents of the selected message.*

HOW NEWSGROUPS WORK

Five main types of newsgroups exist: the Usenet hierarchy, the various alternative hierarchies, Clarinet (a fee-based hierarchy from United Press International), local newsgroups, and mail reflectors (which convert e-mail-based discussion groups into newsgroup format, for distribution). The Usenet hierarchy contains eight major categories, identified by the following prefixes: *comp, news, rec, sci, soc, talk, humanities,* and *misc.* Although Usenet newsgroups are usually distributed on the Internet, they don't have to be. In fact, Usenet predates the Internet.

To create a new Usenet group, you must submit a proposal (called a "request for discussion"), and your proposed new group is ultimately subject to a vote. The first alterna-

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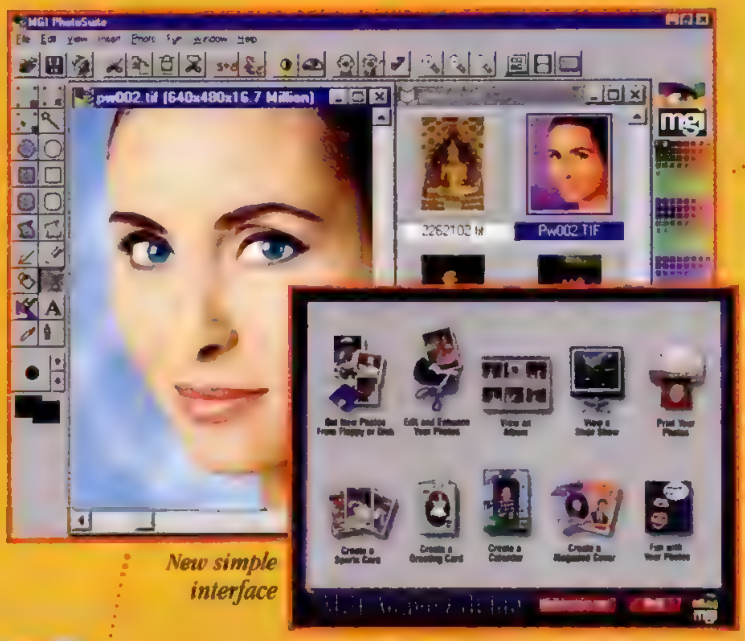

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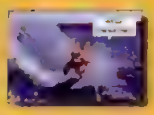

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CIRCLE 074 ON READER SERVICE CARD

The 1996 PC Magazine Shareware Awards

The winners of this year's Shareware Awards were honored at a ceremony held on June 27, during the Shareware Industry Conference in Phoenix, Arizona. Editors from *PC Magazine*, *Computer Gaming World*, and ZD Net evaluated over 5,000 shareware programs introduced or upgraded in the last year. The 35 finalists are listed by category, with the winners in boldface. Free Agent, from Forte Technologies, won our Best of the Year award.

Each program listed below is available for download from PC Magazine Online, located at *http://www.pcmag.com/download/dl-award.htm*. The programs are also available from ZD Net on CompuServe; you can access more information about them as well as downloading instructions by typing GO ZDAWARDS.

Program name	Download filename and size
Applications	
Access Elf (Elf Software Co.)	ACCELF.ZIP (1,024K)
My Personal Diary for Windows 95 (CAM Development)	**MPD32.ZIP (706K)**
Page After Page (Full Sail Software)	PAGEAP.ZIP (772K)
TSS WordContact (Total System Solutions)	WC16.ZIP (901K)
WordExpress for Windows 95 (MicroVision Development)	WXPR32.ZIP (1,560K)
Business & Finance	
Account Pro for Windows (ACCSoft)	ACPROW.ZIP (1,012K)
Atrex Inventory Control (Millenium Software)	ATX.ZIP (4,840K)
Personal Stock Monitor (Anatoly Ivasyuk)	PSM.ZIP (297K)
Power Planner (Sphygmic Software Ltd.)	PPLAN.ZIP (2,828K)
SmartDraw 95 (SmartDraw Software Inc.)	**SMDR32.ZIP (1,281K)**
Internet	
CuteFTP 32 Bit (Alex Kunadze)	CFTP32.ZIP (295K)
Free Agent (Forte Technologies)	**FAGENT.ZIP (718K)**
HotDog Professional (Sausage Software)	HOTDO.ZIP (1,590K)
ReVoL Web Worker (Jon Lister)	RVLWW.ZIP (2,549K)
Surfbot (Surflogic LLC)	SRFBT.ZIP (1,161K)
Math & Science	
Graphmatica for Windows (kSoft)	GRMATW.ZIP (174K)
Microscope (Molcol Software)	SCOPE.ZIP (2,755K)
Qnet for Windows (Vesta Services)	QNETW.ZIP (1,178K)

Program name	Download filename and size
Math & Science (continued)	
PC-Track (Johnson Scientific International)	PCTRA.ZIP (651K)
WPlot (William Hood)	**WPLOT.ZIP (154K)**
Networking	
ConfigIt (James Ednie)	CNFGIT.ZIP (54K)
Daylight Novell NLM (Dynamic Application Programming)	DAYLTE.ZIP (4K)
NWMenu (Nick Payne)	NWMENU.ZIP (71K)
WOMenu (Bremer Corp.)	WOMENU.ZIP (539K)
X-Forum3 Network Message Forum (Extensions Software Corp.)	**XFORUM.ZIP (189K)**
Programming Tools	
ABM for Windows 95 (Attrasoft)	ABM32T.ZIP (872K)
HEXpert for Windows (Matthew Woolsey)	HEXPRT.ZIP (105K)
Liberty Basic for Windows (Shop Talk Systems)	LBWIN.ZIP (1,171K)
ShareMan (Bernd Cordes)	SHAREE.ZIP (246K)
WinEdit (Wilson WindowWare)	WINEDT.ZIP (1,173K)
Utilities	
CD-Quick Cache for Windows 95 (Circuit Systems)	CDQC32.ZIP (335K)
Microangelo for Windows 95 (Impact Software)	MUANGL.ZIP (616K)
SmartBoard (Oakley Data Services)	SMTBRD.ZIP (345K)
TopDesk (SnadBoy Software)	TOPDSK.ZIP (87K)
WinZip for Windows 95/NT (Nico Mak Computing Inc.)	**WZNT.EXE (486K)**

tive hierarchy, *alt*, arose because some people felt a vote should not be necessary. You can start a newsgroup in the alt hierarchy without a vote; you need only write a newsgroup control message compelling enough to convince news administrators to go along with it. Other alternative hierarchies have appeared as well, each with its own rules for adding new groups. For example, the *biz* hierarchy is the only Usenet area where you can post advertisements with impunity.

The alternative hierarchy newsgroups may sidestep Usenet rules, but all the rules of newsgroup etiquette still apply. If you violate these rules—for example, by posting ads for your new widget in nonbiz discussion groups—you will get an avalanche of hate mail, or worse. Orientation documents designed to help prevent netiquette gaffes such as this can be found in the newsgroup *news.announce.newusers*.

On the plus side, if you do manage to get your newsgroup accepted and distributed, you won't have to go to the trouble of registering your newsgroup with various search engines, as you do with new Web sites. News servers on the Internet use the Network News Transfer Protocol (NNTP) to transmit information from server to server and from server to client. As your newsgroup is propagated around the world via newsfeed agreements between news server managers, it is automatically added to the list of newsgroups. When a news reader such as Free Agent requests a list of newsgroups from the server, your newsgroup will appear.

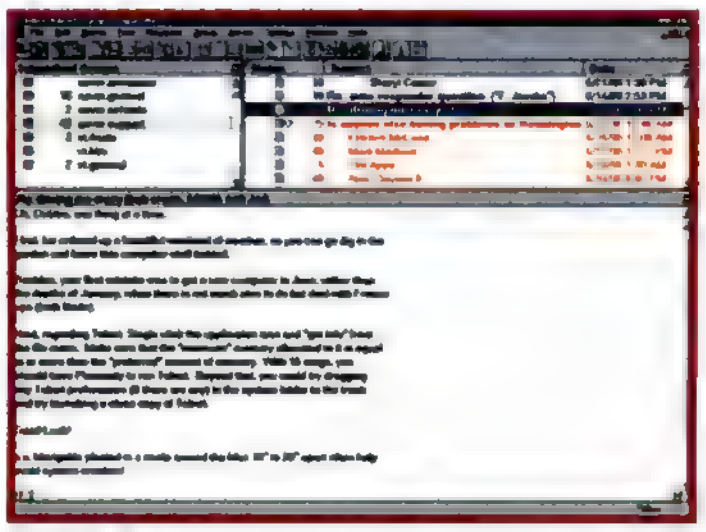

FIGURE 2: *Agent comes with a full-feature address book that lets you create named groups of addresses.*

WHAT YOU GET FOR FREE

Free Agent is a 16-bit news reader. Like Agent, it uses a simple and clear three-pane format (see Figure 1). The panes can be rearranged, but by default, the top-left pane lists the newsgroups, the top-right pane lists the headers for the selected newsgroup, and the bottom pane shows the message body of the selected header.

Free Agent lets you "subscribe" to the newsgroups you visit regularly, and you can configure the Groups list box to display all groups, groups to which you subscribe, or new groups added to the server since the last time you checked.

Both Agent and Free Agent are highly configurable. Just about every setting can be customized, including whether to work online or off-line. You can tell Free Agent under what conditions to mark messages read, what information to download when you go online, how long to keep messages, and much more. By default, messages are threaded by subject, with replies indented. The display can be collapsed or expanded. Messages you've read are displayed in a different color from those you haven't, and you can even select your own color scheme. If you find a particular message of interest, you can click the Keep icon to save the message, regardless of its age.

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A built-in decoder for handling binary attachments saves you from having to save the message, edit out the header, then decode and display it with other software. Even multiple binary attachments can be decoded, saved, and automatically launched from within Free Agent.

Free Agent's internal multitasking functionality lets you perform multiple online tasks at once. For example, you can download headers from one newsgroup while downloading message bodies from another. This capability is easily implemented in the Windows 95–compatible Agent by launching a new thread for each process, but in a 16-bit Windows 3.1 application like Free Agent, it takes some doing.

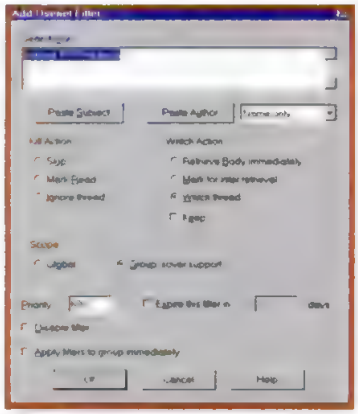

FIGURE 3: *Watch and Kill actions can be global in scope or apply only to a specific newsgroup.*

A *sampling* feature lets you view the first 50 or so headers in a newsgroup before deciding whether or not to subscribe to it. The number of headers to sample is 50 by default, but you can change it to fewer.

To help you sort through the massive volume of messages, you can employ the Watch Thread and Ignore Thread options. If you come across a thread that you know you will want to follow, you can click the Watch Thread icon and all the message bodies in that thread will automatically be retrieved when you go online to download new headers. Conversely, if you find a thread you know you won't want to read, you can click the Ignore Thread icon and Free Agent will automatically mark all messages in that thread as "read" so they don't clutter up your new-messages list.

AND FOR A SMALL FEE . . .

Should you use newsgroups a great deal, you will probably want to purchase Agent, the full-feature version of the product. Agent includes all the features of Free Agent, plus some additional tools to help manage the flood of information. Free Agent lets you respond to newsgroup messages in e-mail but does not have a facility for retrieving e-mail; Agent does.

In addition to full send-and-receive e-mail capability, Agent offers a well-designed address book (shown in Figure 2) and the ability to create folders for storing and organizing messages of interest. The folders are displayed, optionally, in the newsgroups list box.

If you have been using Eudora or Pegasus for e-mail, it will be easy for you to move to Agent, thanks to its Import Messages capability. To use this, you must first download and execute a utility to convert the messages to standard Unix format. This sounds more complicated than it is. It took us under 3 minutes to download the utilities, figure out how to use them, and import the data. You can even convert your address book as well.

Agent's e-mail reader is thoroughly capable. It offers subject-based threading and the ability to filter incoming messages into different folders based on the sender, the recipient, the reply-to address, and the subject. Quoted portions of messages are displayed in a different color for readability. You can set up a variety of *signatures*—text appended automatically to the end of every message you send—and then switch between them. Agent's mail client also lets you skip or sample long e-mail messages, and it automatically decodes binary attachments.

Agent offers an enhanced version of the Watch and Ignore features found in Free Agent called Watch and Kill lists. These filtering capabilities let you set criteria based on subject or author (see Figure 3). The Kill filter options let you skip threads, mark them as read, or ignore them altogether. The Watch filter options let you retrieve message bodies immediately or mark them for later retrieval. A filter can be global or applied to a particular newsgroup, and you can optionally assign a time limit for the filter.

The folder feature in Agent can be used to store and organize newsgroup messages as well as e-mail. To move a message to a folder, simply drag and drop it. Agent also includes a sorting option that lets you sort the messages in newsgroups or folders by thread (the default), subject, author, date, or size.

If you are using Windows 95 and want to work off-line, you will want to purchase the 32-bit version of Agent, because it has been customized to work correctly with the Windows 95 Winsock. Free Agent, which is 16-bit software, cannot trigger the Windows 95 Winsock dialer, so you must go online and off-line manually, from outside of Free Agent.

Free Agent is currently a 1.0 release, while Agent is .99e. Version 1.0 of Agent will be free to all Agent .99e customers, however, and it will include additional features such as cross-post management (marking duplicate postings in separate newsgroups as "read"), MIME support, and a customizable toolbar.

Free Agent is proof that shareware doesn't have to be second-rate. Much to the contrary, we found Free Agent and its commercial sibling, Agent, to be the most capable Internet news readers available.

Free Agent 1.0. List price: Free. **Agent 0.99e.** List price: Downloaded version, $29; shrink-wrapped version with printed manual, $40. Requires: 386-based PC or better; 4MB RAM; 10MB hard disk space; Windows 95, Windows NT 3.5, or Windows 3.1; TCP/IP-driver support for Winsock 1.1 applications; access to an NNTP news server; and (for e-mail) access to an SMTP mail server. Forté Inc., Carlsbad, CA; 219-431-6400; fax, 619-431-6465; http://www.forteinc.com. *Circle 475 on reader service card.* □

SHAREWARE AND UTILITIES

GETTING THE FILES

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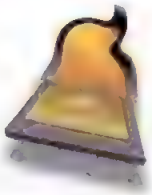

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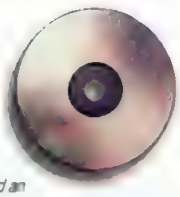

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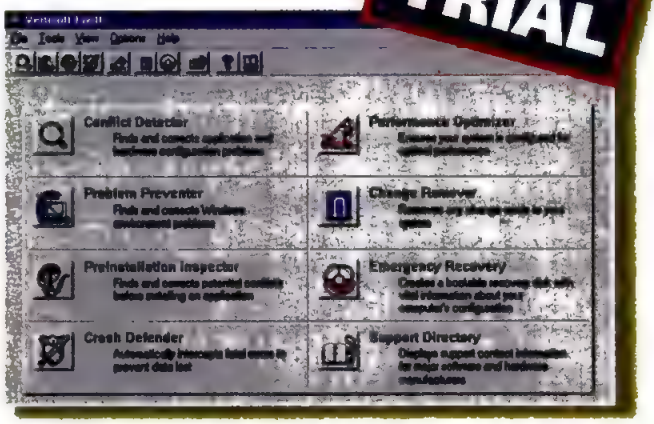

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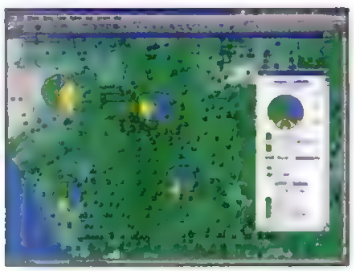

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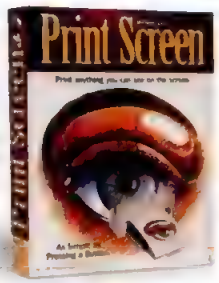

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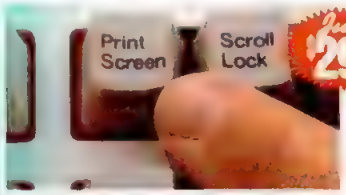

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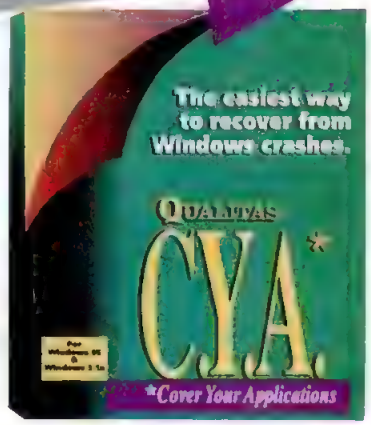

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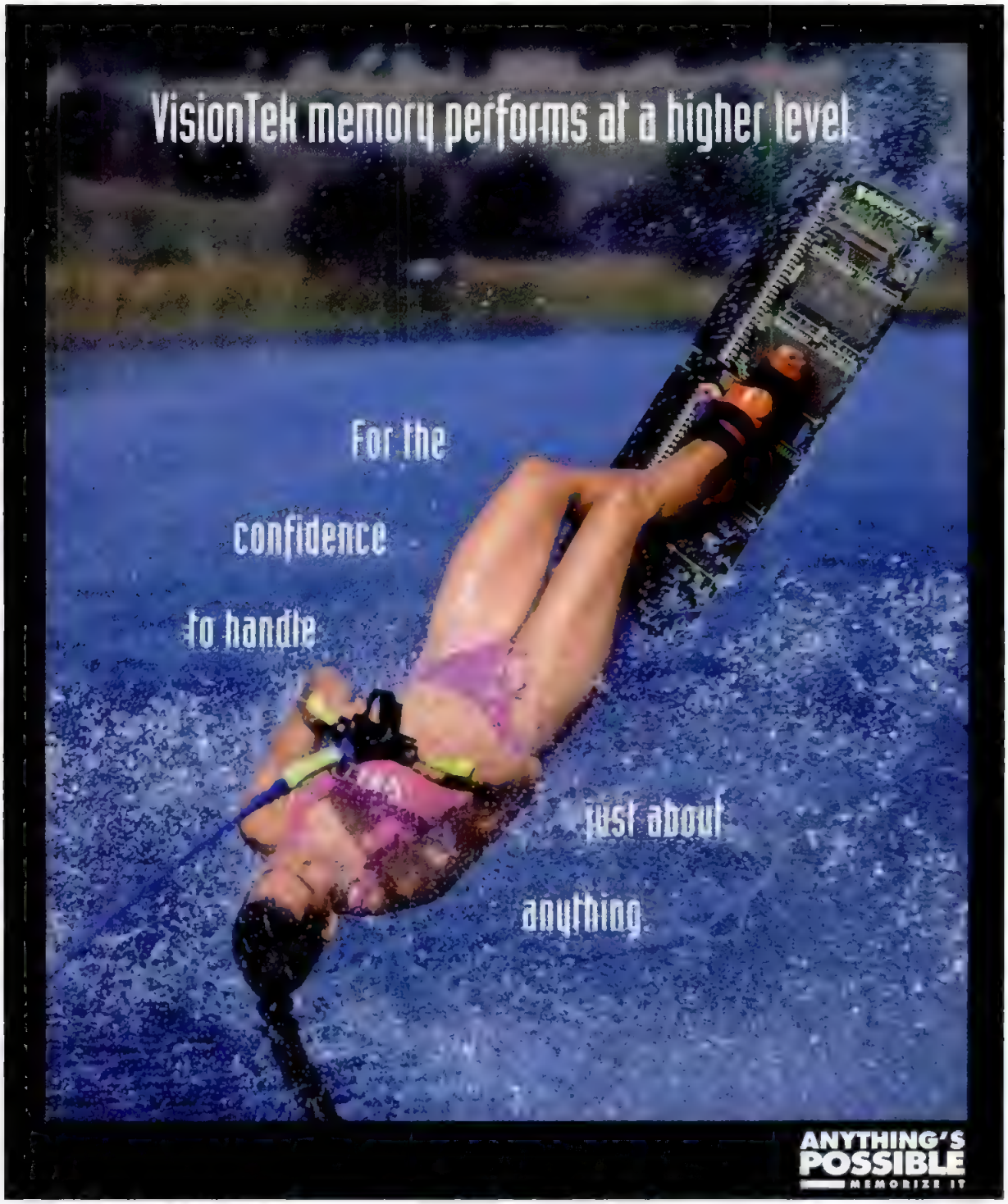

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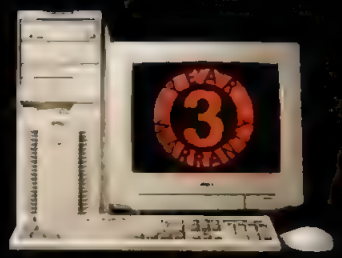

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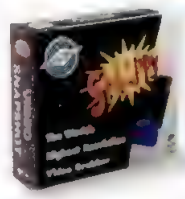

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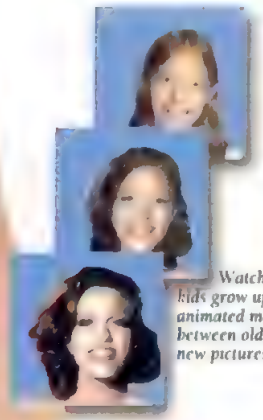

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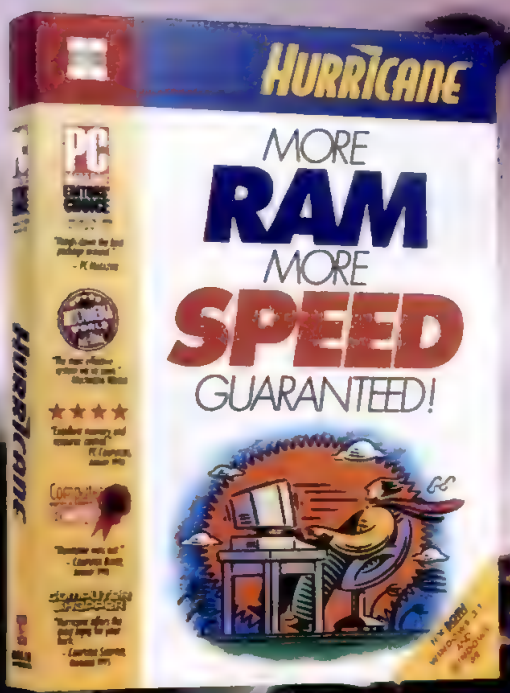

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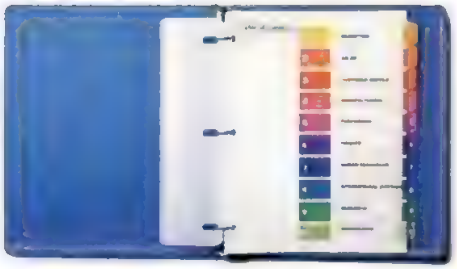

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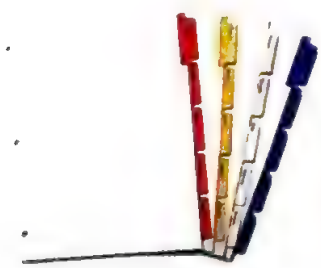

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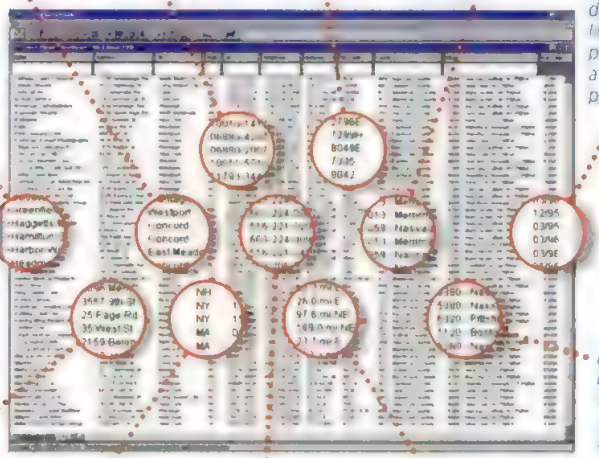

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By Jeff Prosise

High-Performance String Searching

How a smart algorithm can make a big difference.

Why are some programs faster than others? Why, for example, would one word processor require 30 seconds to spell-check a document when another may take only 15 seconds?

Sometimes the speed difference lies in the efficiency of the code. If one programmer can do a job in 100 clock cycles, another might be able to do it in 95. But very often speed isn't attributable so much to minute differences in code as it is to the problem-solving technique that the code embodies. I'm talking about *algorithms*—the step-by-step procedures that tell computers how to do the things they don't do naturally, such as finding the cube root of a number or sorting a list of names. An algorithm describes an approach to solving a problem. The choice of algorithm can have a dramatic impact on a program's performance.

I've been fascinated by algorithms ever since I caught the programming bug more than a decade ago. My first encounter with algorithms came when I wrote a line-drawing routine that relied on sines and cosines to compute pixel positions. I was astounded to find that the code I had so carefully crafted took 10 seconds to draw a line connecting two corners of the screen. This experience led me to learn about Bresenham's line-drawing algorithm, which converts lines into pixels using simple integer arithmetic. This allows it to run many times faster than algorithms that rely on classic geometrical equations.

Among the traditional types of algorithms discussed in computer science textbooks are methods for string searching. The object of a string search is to find occurrences of a specified text string within a larger body of text—for example, to identify occurrences of the string "pain" in the phrase "The rain in Spain." Windows 95's Find utility uses a string search when you type text into the box labeled "Containing text" on the Advanced tab. The Find command in Microsoft Word's Edit menu performs a string search, too. But not all string-search algorithms are created equal. Some are substantially faster than others, and one in particular has become to string searching what Bresenham is to line drawing. The algorithm is called Boyer-Moore, and it's simple enough for anyone to understand. Let's look at it more closely to see how it works. Along the way, you'll see what a difference an algorithm can make.

BRUTE-FORCE STRING SEARCHING

Suppose someone asked you to devise an algorithm for searching a buffer full of text for a specified string. The simplest approach to string searching is the brute-force method, which involves comparing each and every substring in the text that's being searched against the text that's being searched for. Figure 1 shows the steps involved in a brute-force search. Initially, the leftmost characters in the two strings are aligned, so that the "p" in "pain" lines up with the "T" in "The." Then the two characters are compared. If the characters are not the same, the search string "pain" and the arrow specifying the current location in the text that's being searched are shifted right one character position, and the process is repeated. If the characters *are* the same, the arrow is shifted right one position, but the search string is not. If four consecutive characters compare identically, we've found a substring that equals the search text. Otherwise, the search proceeds until the right end of the search string lines up with the right end of the string that's being searched, and a final comparison fails.

> You'd be surprised at the number of applications whose Search commands use the brute-force technique instead of the faster Boyer-Moore method.

You'd be surprised at the number of application programs whose Search or Find commands use the brute-force technique depicted in Figure 1. If the text being searched contains no more than a few thousand characters, brute force is fine, because users aren't likely to complain—and probably won't even notice—if a search requires 0.8 seconds instead of 0.4. But what happens if the target of the search contains millions of characters, or perhaps billions? There's a big difference between waiting 20 minutes and waiting just 10. And that's exactly the kind of difference that Boyer-Moore can make.

THE BOYER-MOORE ALGORITHM

Brute force is the simplest approach to string searching, but it's hardly the best. Given a buffer M whose length is *m* and a search string N whose length is *n*, a brute-force search through all of M for occurrences of N requires at least *m*-*n*+1 individual comparisons. Greater efficiency may be obtained by minimizing the number of comparisons performed.

In 1977, R. S. Boyer and J. S. Moore published a paper entitled "A Fast String Searching Algorithm" that described a more efficient approach to string searching. The method outlined in the paper came to be known as the Boyer-Moore string-search algorithm and has since been the subject of countless papers. The Boyer-Moore technique applies a bit of intelligence—some would say common sense—to the search process that reduces the number of comparisons required. In many cases, a Boyer-Moore search can outperform a brute-force search by a factor of 2:1.

The key to the Boyer-Moore algorithm is the observation that some comparisons are unnecessary, because they can't possibly yield a match between the two strings. Consider the comparison between the strings "pain" and "The rain in Spain," for example. Comparing the rightmost character in "pain" to the corresponding character in "The rain in Spain" (a space) makes it clear that the strings don't match:

```
pain
The rain in Spain
   ^
```

A brute-force string-comparison method would shift one place to the right and try again, as shown here:

```
 pain
The rain in Spain
    ^
```

But in reality, this comparison is unnecessary. The fact that there's no space character in "pain" means the strings can't possibly match as long as "pain" is lined up anywhere over the space between "The" and "rain." Thus, after comparing "n" against " " in the first step and seeing that they are different, we could save time by shifting a full four places to the right, as shown here:

```
    pain
The rain in Spain
       ^
```

This simple modification allows us to do in one step what formerly required four. That's the essence of Boyer-Moore: working from the right end of the character strings instead of the left (notice that the arrow starts out lined up with the "n" in "pain" rather than the "p"), and, after a mismatch occurs, shifting right as many as *n* places instead of just one. (Once again, *n* equals the number of characters in the search string.) When two characters are the same, the arrow is moved one character to the left and the previous two characters are compared. If the number of successful comparisons equals the length of the search text, then a match has been identified.

The trick to implementing the Boyer-Moore algorithm is in knowing how many places to shift after a failed comparison. If the character in the text that you're searching doesn't appear in the search string, it's easy: just shift right a full *n* places. But what if the "n" in "pain" lined up over the "a" in "Spain"? In that case, shifting right more than two places could result in a missed match:

```
       pain
The rain in Spain
         ^
        pain
The rain in Spain
           ^
```

The solution? If the character in the target text appears in the string being searched for, shift right a number of places that equals the distance from the right end of the search string to the character in question. Since "a" is two characters to the left of the rightmost character in "pain," proper procedure would be to shift two places instead of four:

```
       pain
The rain in Spain
         ^
        pain
The rain in Spain
           ^
```

Now the "n" in "pain" lines up with the "n" in "Spain," and the matching substring will be detected.

In practice, it's quite easy for a search program to know how many places to shift for any character in the target text. The secret is to build a table that contains an element for every possible character. For conventional 8-bit character sets, the table contains 256 elements, requiring just 256 bytes of storage. Each entry in the table holds a shift count for the corresponding character. For characters that don't appear in the search text, the shift count equals the number of characters in the search text. For characters that do appear in the search text, the shift count equals the distance from the right end of the search text to the rightmost occurrence of the character. If the search text is "pain," the shift counts for "p," "a," "i," and "n" are 3, 2, 1, and 0, respectively. For all other characters, the shift count is 4. Given a character, a simple table lookup (something that computers can do very fast) then tells you how many places to shift.

Figure 2 shows how Boyer-Moore improves upon the brute-force technique that is diagrammed in Figure 1. In step 1, the "n" in "pain" is compared with the space between "The" and "rain." Because the characters don't match, and because the shift count for the space character is 4, the search text is moved four places to the right, and the arrow is moved with it. In steps 2 through 4, the arrow is moved backward as three successive characters match, and in step 5 the search text is shifted right four places, because of the mismatch between "p" and "r." Note that when a shift occurs, the arrow *always* moves to the end of the search text. In the end, the number of steps required to perform the search is reduced from 17 to 11—a savings of more than 35 percent.

There are many variations on the basic Boyer-Moore algorithm that lend added efficiency to the search process. Even the original Boyer-Moore algorithm is somewhat more complicated than the one discussed here, because it uses an additional heuristic that takes advantage of repeating patterns in the search string. Nonetheless, Figure 2 illustrates the gist of Boyer-Moore string searching in all of its various forms.

```
    pain
The rain in Spain
 1    ^              No match

     pain
The rain in Spain
 2    ^              No match

      pain
The rain in Spain
 3    ^              No match

       pain
The rain in Spain
 4      ^            No match

        .
        .
        .

                pain
The rain in Spain
13              ^    No match

                pain
The rain in Spain
14              ^    One character matches

                pain
The rain in Spain
15              ^    Two characters match

                pain
The rain in Spain
16              ^    Three characters match

                pain
The rain in Spain
17              ^    Got it!
```

FIGURE 1: *Brute-force string searching involves comparing each and every substring in the text that's being searched against the text that's being searched for. While effective, it's hardly efficient. The search shown here requires 17 separate comparisons to find the string "pain" in the phrase "The rain in Spain."*

THE FASTSEARCH PROGRAM

In order to see for myself just how much of a difference Boyer-Moore can make, I took an old DOS text-searching utility I wrote some years ago and modified it to use a Boyer-Moore string search. The original version used a brute-force algorithm similar to the one shown in Figure 1.

The results were telling. In an informal test performed by searching a 40MB document file for a text string that was 11 characters long, the original version of the program needed 65 seconds to search the entire file. The Boyer-Moore version, which I named FastSearch, took only 41 seconds. In some cases, FastSearch required as little as 33 seconds to scan the entire file for longer strings. (One of the interesting char-

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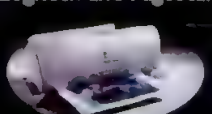

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```
Shift Table for "pain"
Characters                    Shift Count
==========                    ===========
   "p"                        3
   "a"                        2
   "i"                        1
   "n"                        0
All others                    4
```

```
      pain
 1    The rain in Spain          No match; shift right 4 places
        ^                        (shift count for " " = 4)

         pain
 2    The rain in Spain          One character matches;
           ^                     compare the previous character

         pain
 3    The rain in Spain          Two characters match;
           ^                     compare the previous character

         pain
 4    The rain in Spain          Three characters match;
            ^                    compare the previous character

         pain
 5    The rain in Spain          No match; shift right 4 places
         ^                       (shift count for "r" = 4)

            pain
 6    The rain in Spain          No match; shift right 4 places
               ^                 (shift count for " " = 4)

               pain
 7    The rain in Spain          No match; shift right 1 place
                 ^               (shift count for "i" = 1)

                pain
 8    The rain in Spain          One character matches;
                  ^             compare the previous character

                pain
 9    The rain in Spain          Two characters match;
                  ^             compare the previous character

                pain
 10   The rain in Spain          Three characters match;
                  ^             compare the previous character

                pain
 11   The rain in Spain
                  ^             Got it!
```

FIGURE 2: *The Boyer-Moore string-search algorithm speeds string searches by skipping unnecessary comparisons. When a character in the search string and a character in the text being searched do not match, the arrow is moved up to* n *places to the right, where* n *equals the length of the search text. The exact shift count is retrieved from a table built from characters in the search string.*

acteristics of the Boyer-Moore algorithm is that longer search strings will often result in speedier searches.) By comparison, the Find utility that comes with Windows 95 required 34 seconds to perform the same test search. I don't know what search algorithm that Find utility uses, but I'd be willing to bet that it's not a brute-force technique, and that it's probably some form of Boyer-Moore. Find is also written with 32-bit code that's optimized for 32-bit processors, while FastSearch uses generic 16-bit *x*86 code that runs on all Intel CPUs.

In computer programming, there is often a trade-off between memory requirements and performance. Speedier algorithms require more logic, and more logic means more code and more memory. Yet Boyer-Moore added only 100 bytes to the size of the FastSearch executable. It says a lot about the algorithm when a 30 percent or greater increase in performance can be achieved with just 100 additional bytes of code.

In case you'd like to try out FastSearch for yourself, you can download it from PC Magazine Online (see the sidebar "Guide to Our Utilities" in this issue's Utilities column for downloading instructions). You can get syntactical help for FastSearch by typing

```
fs /?
```

at the command prompt. The command

```
fs \docfiles\*.doc "Hello, world"
```

scans all the .DOC files in the \DOCFILES directory and prints the names of those that contain the text string "Hello, world." FastSearch also supports the following command line switches:

- /S for searching subdirectories, too;
- /C for performing case-sensitive searches (by default, searches are not case-sensitive); and
- /A for searching hidden and system files as well as normal files (by default, files marked with hidden and system attributes are not included in the search).

Thus, the command

```
fs \ "Microsoft" /s /c /a
```

searches every file on your hard disk for the word *Microsoft.* (Try it—you may be surprised!) Note that FastSearch may be interrupted by sharing violations if called upon to search an entire hard disk while Windows is running. Just press the F key in response to the "Abort, Retry, Fail" message and FastSearch will skip the offending file and resume the search.

FURTHER READING

Boyer-Moore is one of a larger family of algorithms designed for performing exact string searches, approximate string searches, "sounds-like" string searches, and other types of textual comparisons. You can read more about it in almost any book on classic computer algorithms. One of my favorite such books is *Practical Algorithms for Programmers,* by Andrew Binstock and John Rex (1995, Addison-Wesley). In it, you'll find discussions of all sorts of algorithms (including Boyer-Moore), plus generous amounts of sample code showing how the algorithms are implemented—a key ingredient that's missing from many books of this genre. □

Jeff Prosise is a contributing editor of PC Magazine. *His new book,* Programming Windows 95 with MFC, *was recently published by Microsoft Press.*

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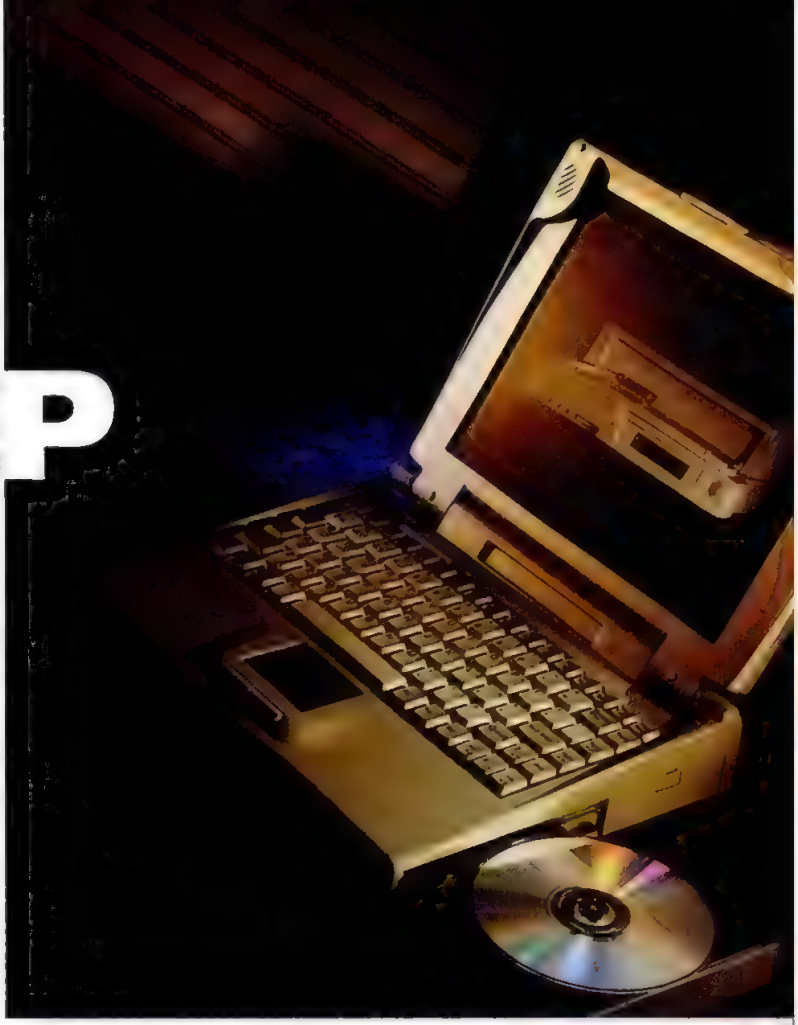

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Attachmate

By Paul Bonner

Now You're Playing with PowerToys

Microsoft's gift makes Windows 95 an OS experienced users can love.

Microsoft Windows 95 does a fine job of protecting naïve users from themselves. No operating system that allows you to do useful work will be completely able to prevent new users and the accident-prone from doing things that they don't really want to do, but Windows 95 comes close, wrapping layer upon layer of protective covering around any potentially destructive facility. For instance, not only does it utilize a Recycle Bin to store files that you've marked for deletion, but before following your instructions to take even that relatively innocuous step, it asks if you're sure that you really want to do so.

Those of us who aren't newbies pay a heavy price for all this protection. For one thing, all those confirmation dialogs are just plain annoying after a while. But worse than that is Windows 95's inflexibility. There are all kinds of customizations and optimizations that *ought* to be possible in any operating system—anything from hiding the Network Neighborhood icon to switching video modes on the fly—but that Windows 95 doesn't allow you to do. You can posit good reasons for each omission if you proceed from the premise that the number-one goal of the operating system is to keep users from doing anything self-destructive. Just think what would happen if a new user hid the Network Neighborhood icon and then couldn't find it later, or how upset that novice user would be if a running application failed to update its palette in response to a change in video mode. But still, no matter how much sympathy you have for novices, there ought to be a way to discard some of Windows 95's "it's for your own good" hand-holding so that you can really tune the environment to work more efficiently for you.

Thankfully, there is a way, and Microsoft makes it available free for the taking. I'm talking about a collection of utilities called PowerToys that you can download from Microsoft's PowerToys Web page (*http://www.microsoft.com/windows/software/powertoy.htm*).

Microsoft bills PowerToys as a collection of software gadgets cooked up after hours by the team responsible for the Windows 95 shell. There is undoubtedly some truth in that, but I suspect that several of the utilities were initially intended for inclusion in either Windows 95 or the Plus! pack and were left out only because they didn't pass the "Could someone who carries cups of hot coffee between his or her thighs hurt themselves with this?" idiot-proofing test. And a few of the gadgets feel very much like out-of-town previews of utilities that may well end up being standard parts of the next Windows 95 update. But who really cares how they came about? The important thing about the PowerToys is that they set you free to use Windows 95 the way you want to. The 13 little utilities in the PowerToys collection offer you the ability to customize your operating environment to your heart's content, eliminating dozens of Windows 95's least-endearing "features." You can download the PowerToys Set as a group or individually download just the ones you want. Each of these utilities is a pretty small file; the whole PowerToys Set will occupy only 234K on your hard disk.

Be aware, however, that the PowerToys aren't products in the traditional sense—Microsoft goes to great pains to state that it won't offer any technical support for PowerToys; nor will it guarantee that the PowerToys utilities will work correctly on your system. If you use them, you do so at your own risk. But that risk should be more than easy to accept for anyone who's ready to take off Windows 95's training wheels. You can fall down with PowerToys, but you can also ride like the wind, something that just isn't possible as long as you keep those training wheels on the OS.

The utilities in the current version of PowerToys, dated June 4, 1996, range from the nearly sublime to the almost ridiculous. Everyone will have a different idea of which description matches which utility, and my own ranking of their relative values changes from moment to moment depending upon what I'm doing with Windows 95. But let me try anyway to provide some sense of the relative importance of each one.

FIGURE 1: *Tweak UI finally gives you control over those pesky aspects of Windows 95, such as the desktop icons that won't go away.*

TWEAKING YOUR WINDOWS 95 EXPERIENCE

Tweak UI is a Control Panel applet that cleared out my "Most Annoying Things About Windows 95" list. Tweak UI makes it easy to change dozens of user interface and shell properties that are otherwise hidden deep within the system registry. For instance, I've used it to speed up the appearance of cascading and pop-up menus, eliminate the "Shortcut to" prefix on new shortcuts, remove several standard desktop icons

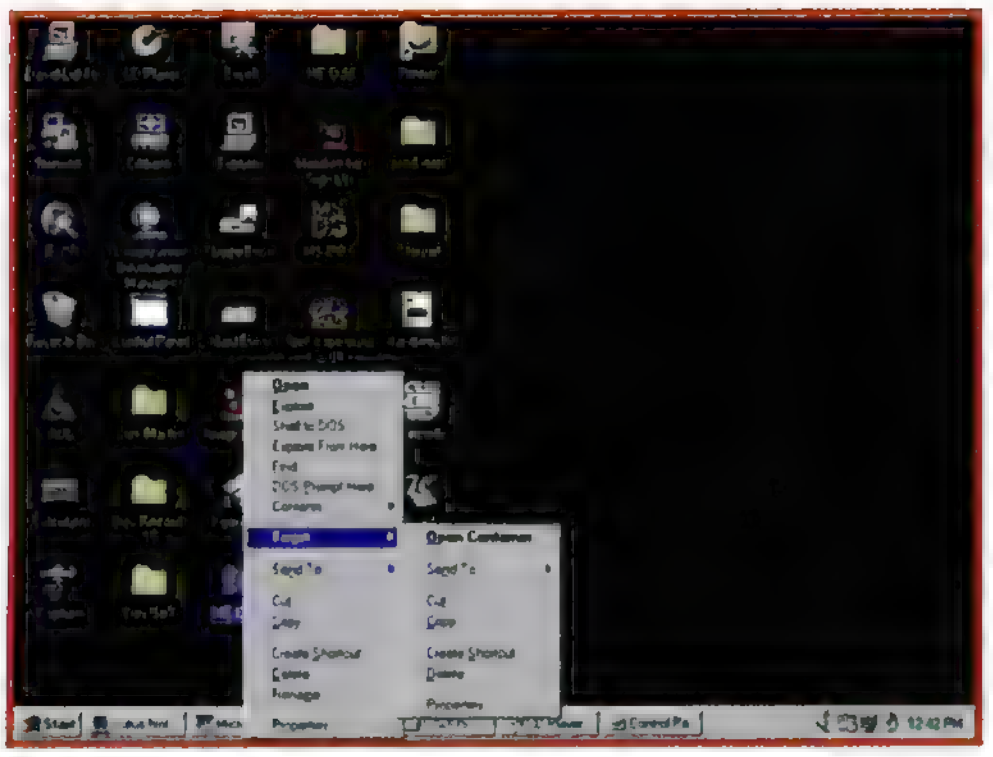


FIGURE 2: *PowerToys lengthens your right-mouse menu with the utilities Explore From Here, DOS Prompt Here, Contents Menu, and Shortcut Target Menu.*

including Recycle Bin, Inbox, and Microsoft Network, create a cascading menu for Control Panel, and modify the Windows 95 boot sequence to eliminate the splash screen and always show the boot menu. And I've barely scratched the surface of other options controlling things like window animation, desktop layout and contents, Explorer configuration, and mouse sensitivity settings.

These might all seem like relatively small changes, but they're important ones in terms of the Windows 95 experience. I absolutely hated that Microsoft Network icon, and I detested the "Shortcut to" prefix so much that I stopped creating shortcuts. Changing those settings doesn't necessarily make me any more productive, but it certainly leaves me in a better mood.

A ROUND OF SHELL EXTENSIONS

Six of the PowerToys take the form of shell extensions: Contents Menu, Explore From Here, Shortcut Target Menu, CabView, DOS Prompt Here, and CD AutoPlay Extender. Each of these modifies the pop-up menu that appears when you right-click on a file, a folder, or a shortcut in Explorer (or in a standard Open or Close dialog).

Contents Menu adds a cascading submenu (labeled Contents) to the context menu for Folders (and to the shortcuts to folders). When you right-click on a folder and select the Contents submenu, you're presented with a cascading list of the folder's contents. This can be a real time-saver, because it eliminates the need to change the current folder in Explorer (with the accompanying delay as Explorer refreshes its file list) in order to locate or open a file stored in a different folder. Instead, you can simply right-click on the target folder to pop up its context menu without activating the folder, and then select the file you're after from the cascading Contents submenu.

Explore From Here also extends the context menu for Folders, this time by providing a fast way to a new Explorer window that uses the target folder as its root. The new Explorer window will display the contents of the target folder and can also be used to display the contents of any folders the target contains, but this new window won't allow you to go higher up on the disk hierarchy than the target folder's root. This can make Explorer much more responsive when you're working with a big or deeply nested network drive, because it allows Explorer to zero in on a particular portion of the drive without the overhead of working with the entire drive. For instance, when you hit F5 to refresh the Explorer window, Explorer only has to refresh its display of the specified root folder and its contents, rather than the disk's entire directory structure.

The *Shortcut Target Menu* shell extension adds a cascading Target menu to the context menu for shortcuts. The new submenu contains the complete context menu for the shortcut's target, which means that you can perform any context menu operation on a shortcut's target file without having to locate the file itself. This utility is especially useful when you put it to use with a directory full of shortcuts, such as the Start directory, which contains all of your Start menu items. For instance, you could view the version information for any executable file that appears on your Start menu by right-clicking on its shortcut and selecting the Properties item on its Target menu. Alternately, you could cut or copy the target file, or perform any other operation that would be possible if you had located the file itself rather than just a shortcut to it. In addition, the Target menu includes an Open Container item that opens a new Explorer window displaying the contents of the directory in which the shortcut's target file appears. So, as long as you can find a shortcut to a file, you can get to its directory quickly—even if you don't have the slightest clue where the file itself is located.

> A few of the PowerToys feel like out-of-town previews of utilities that may end up in the next Windows 95 update.

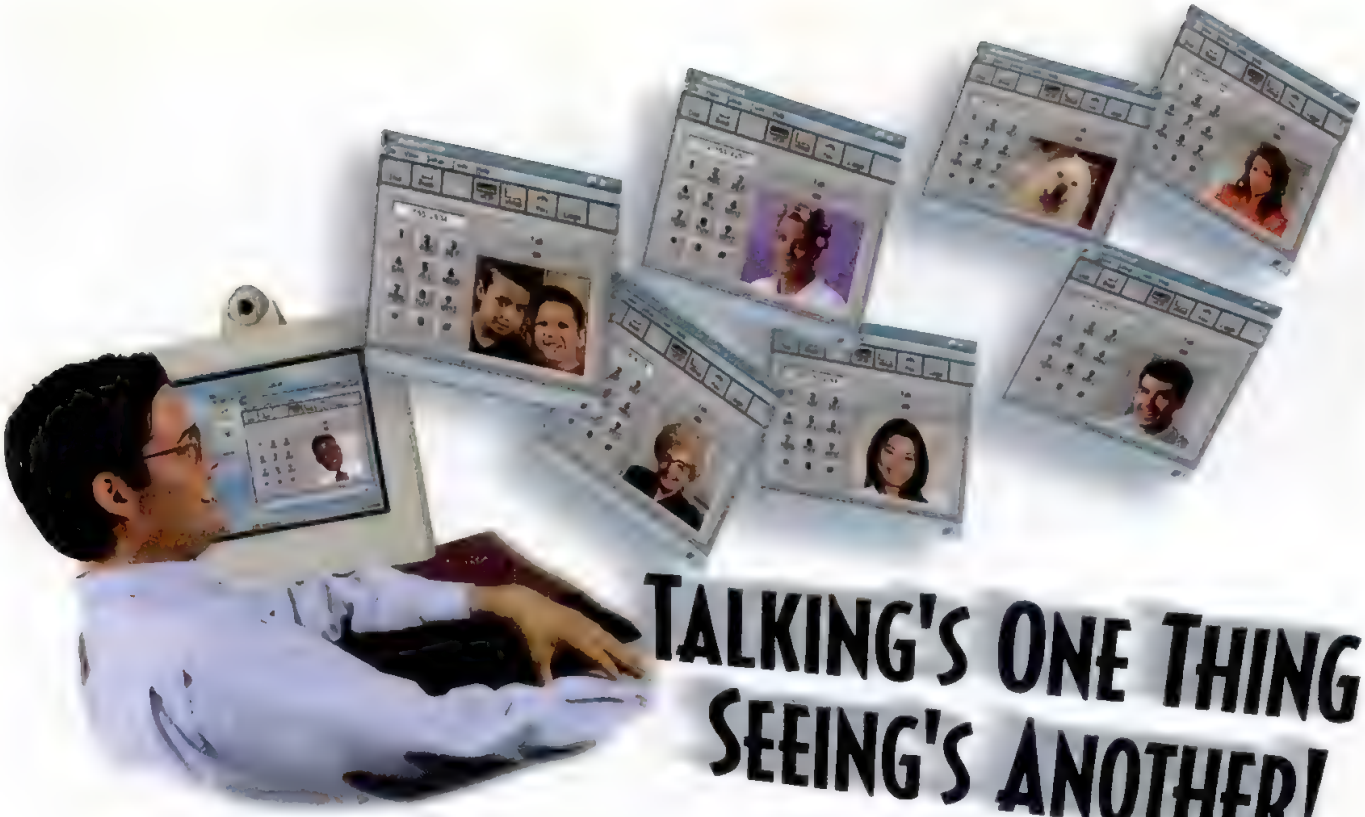
Lately, Microsoft has taken to storing the files on software distribution disks in compressed .CAB files. You might wonder why, given the still relatively expansive capacity of the CD-ROMs that have become Microsoft's preferred distribution media, but that's neither here nor there. The more cogent question is: What exactly are you supposed to do with a .CAB file? How do you get files in and out of it? How do you find and replace just one driver or one sample file from your Windows 95, Visual Basic 4.0, or Word for Windows 7.0 installation? Off-the-shelf Windows 95 doesn't contain any tools for opening .CAB files or viewing or working with their contents.

That's where *CabView* comes in, through the addition of a View item to the context menu for .CAB files. When you elect to view a .CAB file, CabView displays its contents in an Explorer window. This gives you the ability to copy any or all of the files from the .CAB archive to your disk, either by dragging them into a destination folder or onto the desktop or by selecting the Extract item, which appears by itself as the sole item on the pop-up context menu for files stored in a .CAB archive.

The ability to extract files from .CAB files selectively makes life a lot easier when you're trying to restore a single damaged or missing file. Rather than being forced to repeat a Setup operation that may or may not solve the problem, you can locate the source file you need easily and make the replacement yourself. Generally, you can even find a road map to the contents of each .CAB file in an .INF file somewhere on your setup disk. (.INF files generally appear in the same directory as SETUP.EXE and are usually not compressed. In the case of Windows 95, however, the .CAB file contents map is LAYOUT.INF, which is stored in PRECOPY2.CAB in the WIN95 subdirectory of the Windows 95 installation CD.)

DOS Prompt Here is a convenient little utility that opens a DOS window with the prompt already located at the directory of the folder you specified. It prevents searching though directories for the exact location of a file if you need to do some work on it, and it's especially useful for folders residing on your desktop.

CD AutoPlay Extender brings CDs that have yet to adopt AutoPlay technology kicking and screaming into the world of Windows 95. Inserting such a CD into your CD-



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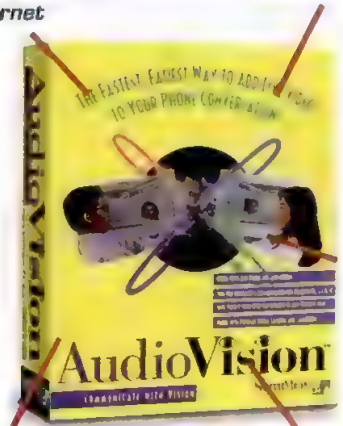

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FIGURE 3: *QuickRes, the most useful PowerToy in the bunch, allows you to change screen resolution on the fly.*

ROM drive prompts the AutoPlay Extender dialog box to pop up. It identifies the CD in the drive and offers you the option of running the setup file, adding or removing a shortcut for the CD anywhere on your system, exploring the CD-ROM's directory, or, if it's already been installed, running the CD. AutoPlay Extender is not a utility that's going to make your teeth any whiter, but it saves you the trouble of finding the appropriate run command when there's no AutoPlay.

FILLING UP YOUR TRAY

The PowerToys collection also includes three useful Taskbar notification areas (little applets that display an icon in the Taskbar's tray area alongside the clock display): Telephony Location Selector, FlexiCD, and QuickRes.

Telephony Location Selector is for mobile users who have defined multiple dialing locations for telephony operations. It presents a pop-up menu of the dialing locations you've defined, letting you change the current location at will, and it also provides quick access to the Dialing Properties dialog (used to define dialing locations) and to the Phone Dialer applet.

FlexiCD is an audio CD player for those of us interested in listening to CDs, not compulsively cataloging their contents. FlexiCD monitors your CD-ROM drive and displays a single-click play/pause control when it finds an audio CD there. Its right-click pop-up menu also provides the ability to start from the beginning of the CD, to stop or eject CDs, and to select any track. FlexiCD doesn't let you build a database of the titles of each track on each CD you play or otherwise prompt you to retype the information printed on the CD's cover, but it's easy, automatic, and, at least for my purposes, sufficient.

QuickRes accomplishes even more from its tiny spot on the Taskbar; it delivers the ability to switch video resolutions on the fly without restarting Windows 95. I know, we all *thought* that Windows 95 would be able to do that by itself, but every time I change video modes, I get a message box telling me to restart Windows 95 for the change to take effect. When you're running several applications, each of which took a lot of effort to get to its current state, the option of starting over just to have a preferable video mode is not worth all the trouble. With QuickRes, on the other hand, you can switch from any mode supported by your display to any other merely by picking the new mode from QuickRes's pop-up menu. A snap, crackle, and screen flash later, Windows 95 will redraw its screen in the new mode.

QuickRes's ability to change video modes on the fly seems like magic—and it almost works. The only problem is that some applications may not recognize the change. For instance, Jasc Software's Paint Shop Pro, which I use to produce screen captures, fails to take note of color depth changes. Its display can thus become horrific if I switch the video driver from a 16-million-color mode to a 256-color mode. Fortunately, the problem can be solved by exiting the program and restarting it. That's a minor annoyance compared to restarting Windows 95 from scratch and doesn't detract too greatly from QuickRes's overall value.

SPIN ME A WEB

Of course, like everything else coming out of Microsoft these days, PowerToys has recently gained a Web angle: The *HTML Printer Driver* theoretically lets you "print" an HTML Web page from any Windows application. That's not a bad idea, and the HTML Printer Driver makes a decent first stab at making it work. You wouldn't want to use it to generate an entire Web site—probably not even an entire Web page—but it can serve as a quick way to put an HTML wrapper around tabular reports or other data. But if you intend to use the current initial version of the HTML Printer Driver (updated January 17, 1996), you should plan on spending some time cleaning up the appearance of the resulting HTML code before you put it into a Web page that anyone else will see. You also might want to brace yourself for occasional crashes, which will require a Windows restart before you can print anything again. Otherwise, wait for an update before putting much faith into this one.

SILLY STUFF

The final two PowerToys, Round Clock and XMouse, are silly things, more like demos of Win32 API functions than useful utilities. *Round Clock* is just that—a version of the Clock accessory that displays in a round window when you set it to borderless analog mode. *XMouse* emulates X Window by setting the input focus to any window that the mouse passes over—without your having to click on the window and without bringing the window to the foreground when it receives the focus. This must have some value—but you'd have to ask the X Window–definition committee members what that is, because I certainly haven't discovered it.

And with that, we've covered the current PowerToys lineup. The lineup does change from time to time, usually by the addition of new gadgets, but occasionally by subtraction. (For instance, one of my favorite original PowerToys, a SendTo menu extension for copying or moving files to any specified folder, is missing from the current group.) In addition, the collection receives fairly frequent updates and bug fixes, so it's worth your while to monitor the Web page even after you've downloaded and installed PowerToys. If it isn't clear by now, I urge you to download PowerToys immediately, because Windows 95 will never be the same once you discover them. □

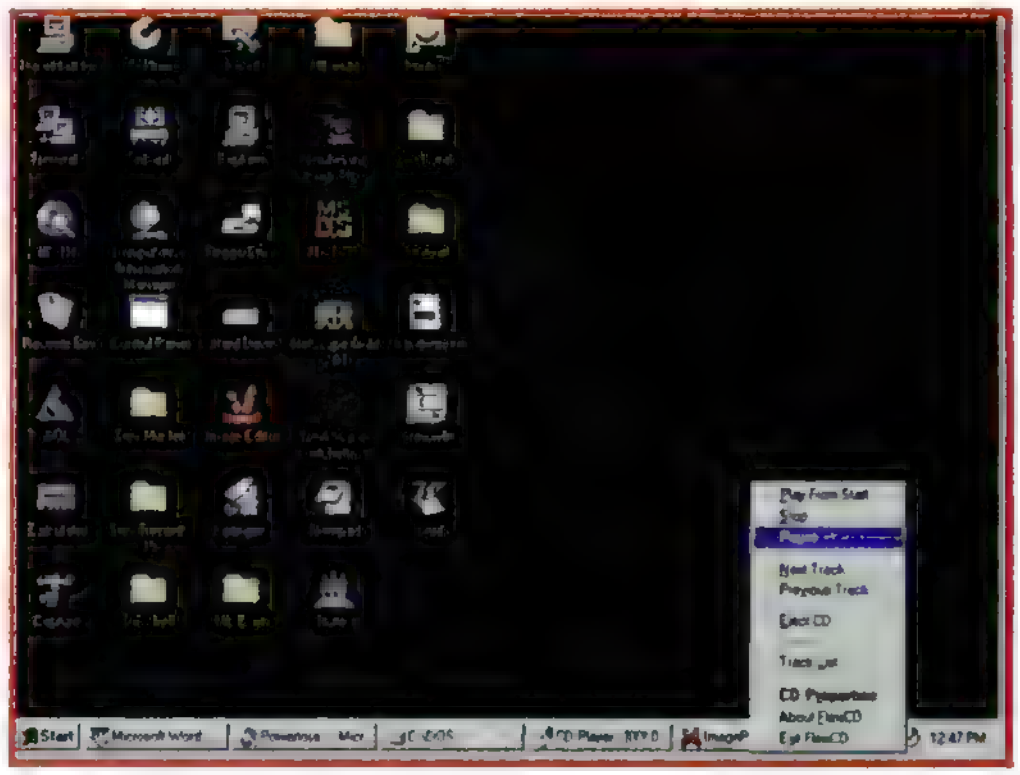

FIGURE 4: *FlexiCD adds a pared-down version of the CD Player to your Taskbar tray for easy access to basic play functions.*

Paul Bonner is a freelance writer, systems consultant, and visual programming specialist. He lives and works in Boston and can be reached at pbonner@zd.com.

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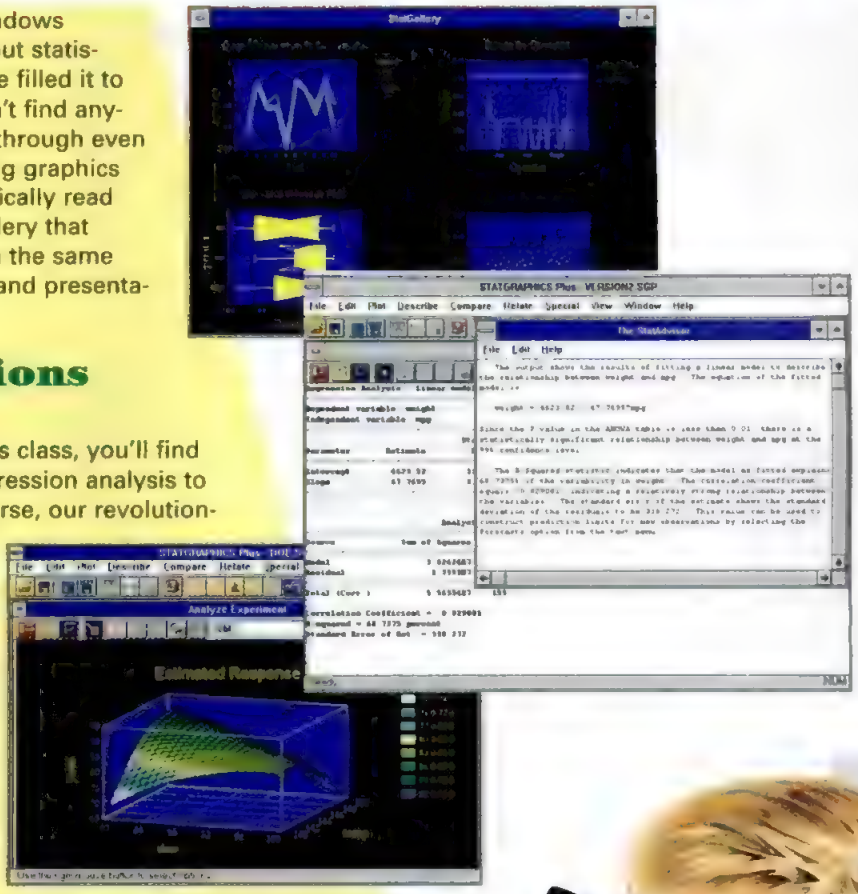

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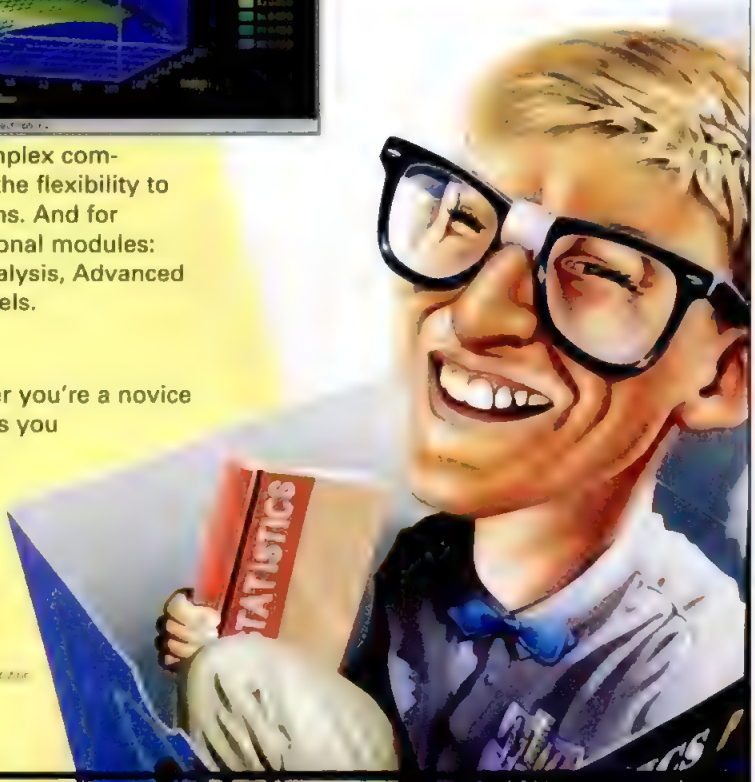

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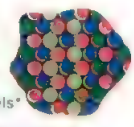

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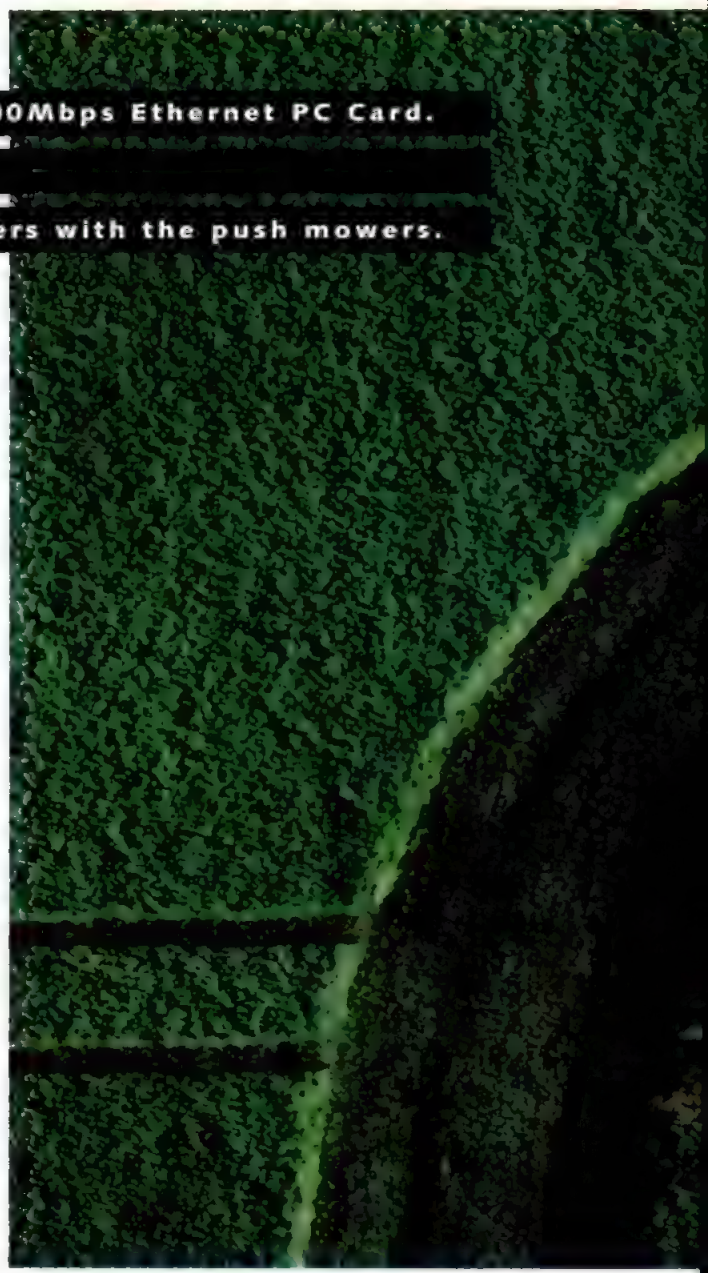

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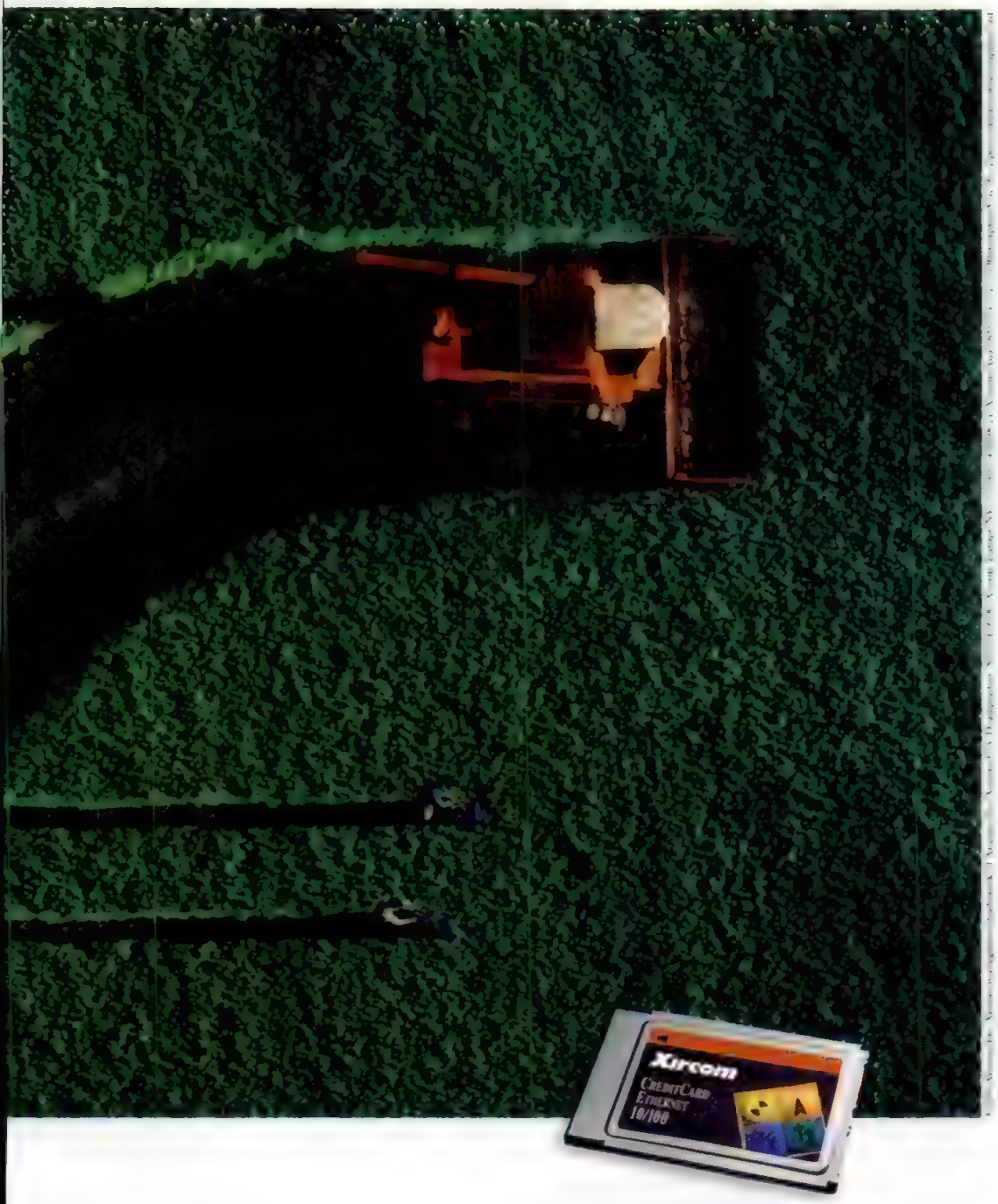

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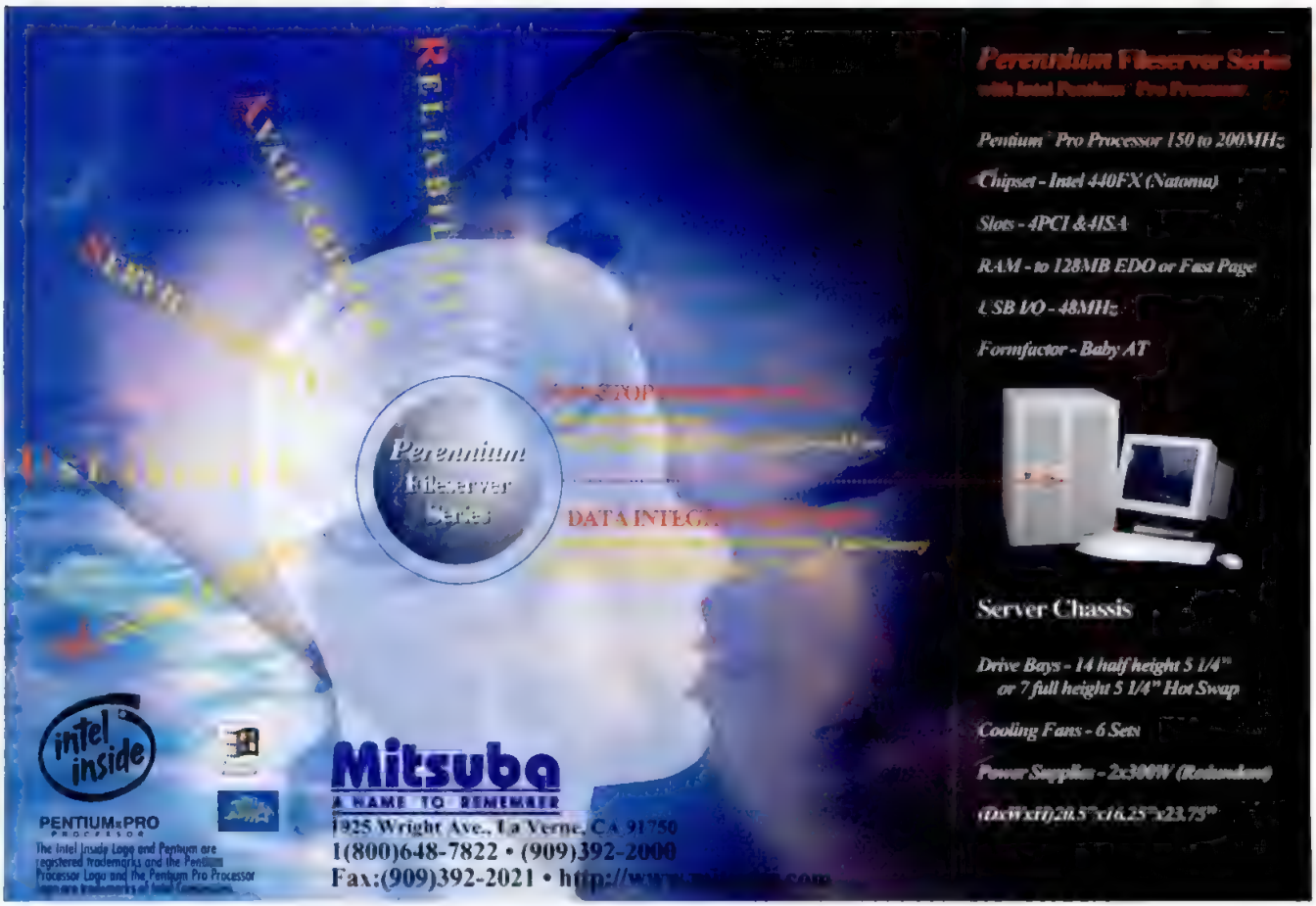

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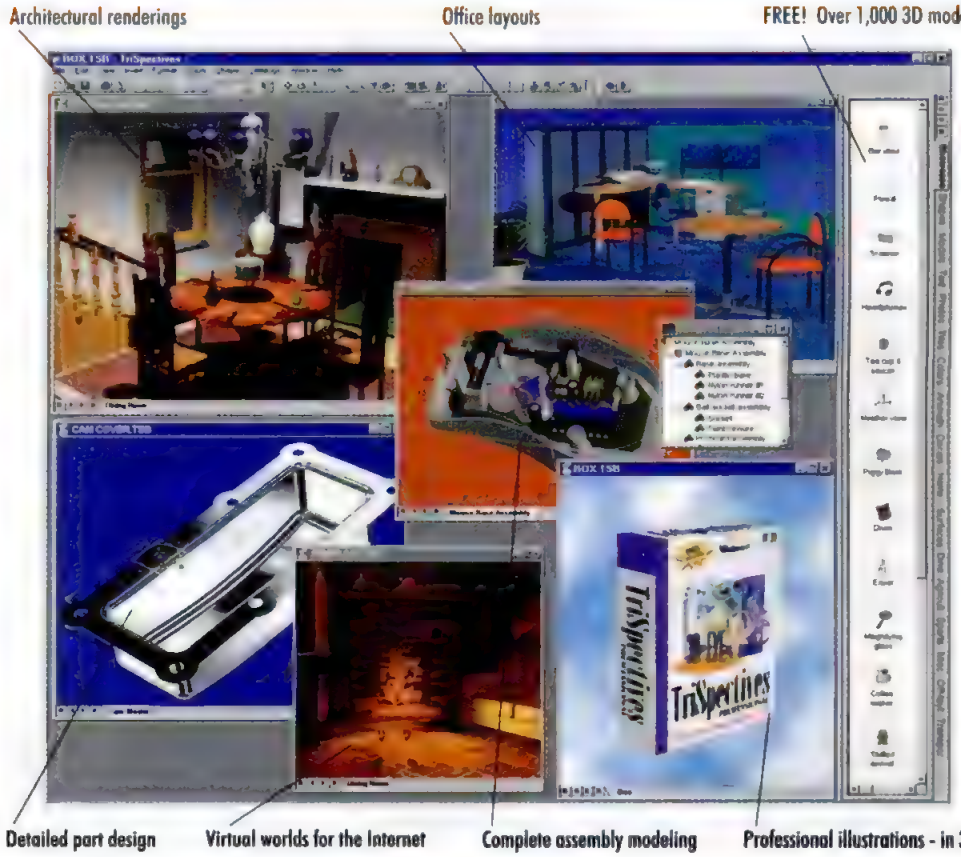

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CIRCLE 032 ON READER SERVICE CARD

By Jeff Prosise

Prevent Multiple Win32 Application Instances

How to detect whether a copy of your program is already running.

It's an old question, but one that's asked a lot, especially by Windows 3.*x* programmers making the move to Windows 95 and Windows NT: How do I prevent multiple instances of my applications from running?

In 16-bit Windows, the answer was simple: Check the hPrevInstance parameter passed to WinMain and terminate if hPrevInstance holds a non-NULL value. But in 32-bit Windows, it's not that easy. Because Win32 processes run in separate address spaces, hPrevInstance is always NULL, no matter how many other instances may be running.

That doesn't mean a Win32 application can't detect other instances of itself and prevent further instances from running. In fact, there are several techniques to detect previous instances in Win32. Minor variations on these techniques permit applications to count the number of instances concurrently running (when multiple instances are allowed) and to limit the number of instances permitted.

This article offers Win32 programmers four methods of dealing intelligently with multiple application instances. Sample applications demonstrating all four methods are available for downloading from PC Magazine Online. The file Nomult.zip contains the source code, executables, and Visual C++ 4.*x* .MAK files for the sample programs, which are called App1, App2, App3, and App4. It also contains the source code and executable for App4Lib.dll, a DLL used by App4. All four sample applications prevent multiple instances of themselves from executing. The technique each application uses is indicated by the number in its name: App1 uses method 1, App2 uses method 2, and so on.

METHOD 1: FINDWINDOW

One of the easiest ways—and probably the one most commonly used—to detect previous instances of a Win32 application is to use the FindWindow API function to find out whether there is another top-level window created from the same WNDCLASS in the system.

FindWindow accepts two parameters: a pointer to a WNDCLASS name (or optionally, an atom specifying the WNDCLASS name) and a pointer to a window title. It returns the handle of the first top-level window whose WNDCLASS and window title match the parameters specified in the call, or it returns NULL if there is no window with those attributes.

Let's say your application's WinMain function registers a WNDCLASS named MyWindowClass and then calls CreateWindow or CreateWindowEx to create a window from it. To prevent multiple instances of the application from running, simply call FindWindow with a pointer to the string "MyWindowClass" in parameter 1 at the outset of WinMain and return immediately if FindWindow returns a non-NULL window handle.

```
int WINAPI WinMain (HINSTANCE hInstance, HINSTANCE
hPrevInstance, LPSTR lpszCmdLine, int nCmdShow)

{
    static char szAppName[] = "MyApp";
    static char szWndClass[] = "MyWindowClass";
    // Use a unique name!
    HWND hwnd, hwndPrev;
    WNDCLASS wc;
    MSG msg;

    // If a previous instance is running, activate
    // that instance and terminate this one.
    if ((hwndPrev = FindWindow (szWndClass, NULL))
    != NULL)
        {
        SetForegroundWindow (hwndPrev);
        return -1;
        }

    // No previous instances are running;
    // proceed normally.
    wc.style = 0;
    wc.lpfnWndProc = (WNDPROC) WndProc;
    wc.cbClsExtra = 0;
    wc.cbWndExtra = 0;
    wc.hInstance = hInstance;
    wc.hIcon = LoadIcon (NULL, IDI_APPLICATION);
    wc.hCursor = LoadCursor (NULL, IDC_ARROW);
    wc.hbrBackground = (HBRUSH) (COLOR_WINDOW + 1);
    wc.lpszMenuName = NULL;
    wc.lpszClassName = szWndClass;

    RegisterClass (&wc);

    hwnd = CreateWindow (szWndClass, szAppName,
        WS_OVERLAPPEDWINDOW, CW_USEDEFAULT,
        CW_USEDEFAULT, CW_USEDEFAULT,
        CW_USEDEFAULT, HWND_DESKTOP, NULL,
        hInstance, NULL);

    ShowWindow (hwnd, nCmdShow);
    UpdateWindow (hwnd);

    while (GetMessage (&msg, NULL, 0, 0)) {
        TranslateMessage (&msg);
        DispatchMessage (&msg);
    }
    return msg.wParam;
}
```

FIGURE 1: *This WinMain function uses FindWindow to detect whether other instances of the same application are already running. If another instance is found, the current application instance brings the previous one to the foreground and then terminates.*

```
int WINAPI WinMain (HINSTANCE hInstance, HINSTANCE
hPrevInstance, LPSTR lpszCmdLine, int nCmdShow)

{
    static char szAppName[] = "MyApp";
    static char szWndClass[] = "MyWindowClass";
    static char szAtomName[] = "<MyApp> Amy's birthday is
                               05-07-93 <MyApp>";
    WNDCLASS wc;
    HWND hwnd;
    MSG msg;
    ATOM atom;

    // Check the global atom table for an instance of
    // szAtomName. If the atom exists, there must be
    // another instance of this application running.
    if (GlobalFindAtom (szAtomName))
    {
        MessageBox (NULL, "Another instance of this
        application is running", "Error", MB_OK |
        MB_ICONSTOP);
        return -1;
    }

    // No previous instance was detected; add szAtomName
    // to the table.
    atom = GlobalAddAtom (szAtomName);

    wc.style = 0;
    wc.lpfnWndProc = (WNDPROC) WndProc;
    wc.cbClsExtra = 0;
    wc.cbWndExtra = 0;
    wc.hInstance = hInstance;
    wc.hIcon = LoadIcon (NULL, IDI_APPLICATION);
    wc.hCursor = LoadCursor (NULL, IDC_ARROW);
    wc.hbrBackground = (HBRUSH) (COLOR_WINDOW + 1);
    wc.lpszMenuName = NULL;
    wc.lpszClassName = szWndClass;

    RegisterClass (&wc);

    hwnd = CreateWindow (szWndClass, szAppName,
           WS_OVERLAPPEDWINDOW, CW_USEDEFAULT,
           CW_USEDEFAULT, CW_USEDEFAULT,
           CW_USEDEFAULT, HWND_DESKTOP, NULL,
           hInstance, NULL);

    ShowWindow (hwnd, nCmdShow);
    UpdateWindow (hwnd);

    while (GetMessage (&msg, NULL, 0, 0))
    {
        TranslateMessage (&msg);
        DispatchMessage (&msg);
    }

    // Delete the atom before exiting.
    GlobalDeleteAtom (atom);
    return msg.wParam;
}
```

FIGURE 2: *This WinMain function prevents multiple application instances by using a global atom as a signal that another instance is already running. This method works equally well with SDK-style and framework-based apps.*

The WinMain function in Figure 1 illustrates how it's done. If FindWindow reveals that there is another top-level window with the same WNDCLASS, WinMain passes the window handle returned by FindWindow to SetForegroundWindow to bring the previously launched application instance to the foreground. If FindWindow returns NULL, execution continues.

The FindWindow method works reliably as long as you use WNDCLASS names that are unlikely to be used by other programmers. Don't use a WNDCLASS name that's as generic as MyWindowClass, or your application might very well mistake another completely unrelated application for a previous instance of itself. You can reduce the possibility of this happening by specifying a non-NULL window title in the call to FindWindow, because even if two applications use the same WNDCLASS name, there's still a good chance they will not be using the same window title.

One drawback to FindWindow is that if two instances of the same application are started in rapid succession, there is a slight possibility that neither will detect the other, and as a result both will start normally. Another problem is that some application frameworks, including MFC, register a unique WNDCLASS for every application instance. If you want bulletproof protection against multiple application instances, or if you're an MFC programmer, you should probably consider another method.

METHOD 2: THE GLOBAL ATOM TABLE

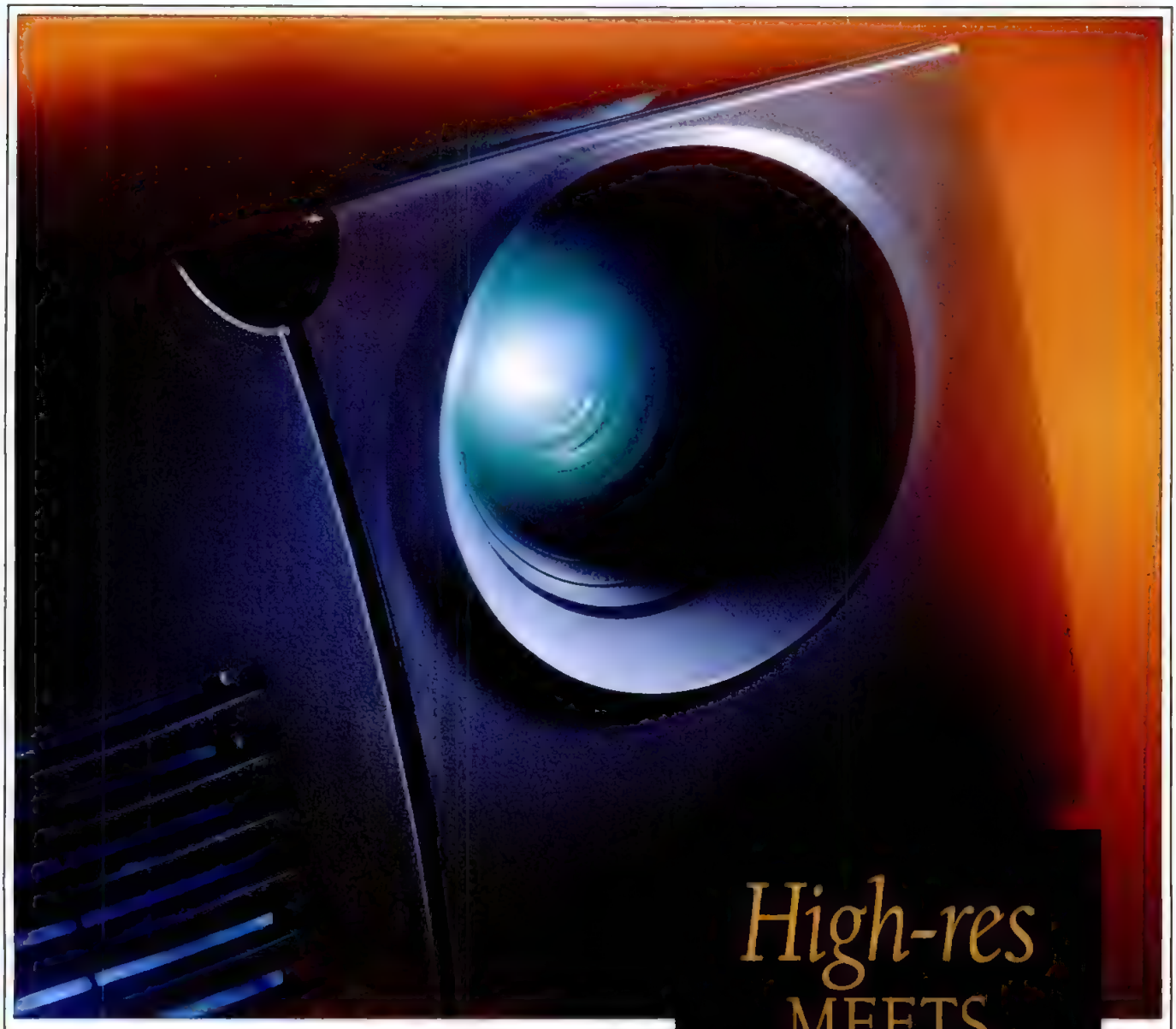
One method of detecting previous application instances that works equally well with SDK-style and framework-based applications uses the *global atom table*, a dictionary-like collection of strings maintained by the operating system. Because the table is a systemwide resource, a string added to it by one application can be retrieved by another.

A string added to the atom table is identified by a value of type ATOM. The Win32 API provides functions for adding and deleting strings (GlobalAddAtom and GlobalDeleteAtom), retrieving a string given an ATOM (GlobalGetAtomName), and retrieving an ATOM given a string (GlobalFindAtom).

The WinMain function in Figure 2 shows how to use the global atom table to detect previous application instances. At startup, the application calls GlobalFindAtom to determine whether the string "<MyApp> Amy's birthday is 05-07-93 <MyApp>" has been added to the global atom table. A return value of 0 means that the string does not exist in the atom table and, by inference, that no other instances of the application are running. In that case, WinMain adds the atom to the table itself. Now each time another instance of the application is started while the first is still running, GlobalFindAtom will return a nonzero value, causing the new instance's WinMain to terminate with an error message informing the user that another instance of the application is running. Note that WinMain deletes the atom from the table before the application ends, so the atom won't be left behind. Failure to delete the atom would prevent any future instances of the application from running.

To use this method in an MFC application, call the GlobalFindAtom function from the application object's InitInstance function and GlobalDeleteAtom from ExitInstance. The resulting application will behave much like an SDK application that uses Figure 2's WinMain.

Applications that use the FindWindow method to detect previous instances enjoy one advantage over applications that use the global atom table. Since FindWindow returns a window handle, activating a previous instance is a simple matter of passing the window handle to SetForegroundWindow. If you wish to activate a previous application instance de-



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tected using the global atom table, you must use FindWindow or a similar method to retrieve the previous instance's window handle.

METHOD 3: NAMED MUTEXES

In another method of detecting existing Win32 application instances, the first application instance to be launched creates a shared thread-synchronization object or file-mapping object. Subsequent instances can then determine whether another instance is running by checking for the shared object's existence.

The WinMain function in Figure 3 uses a named *mutex* to detect previous application instances. A mutex (a contraction of the words *mut*ually and *ex*clusive) is a synchronization object that is usually used to coordinate the actions of two or more threads. The threads can belong to the same process, or they can belong to different processes; it doesn't matter, because mutexes are kernel objects and thus reach across process boundaries. Two processes that use the same mutex identify the mutex by name.

In Figure 3, the mutex isn't used for synchronization purposes. Instead, it functions as a flag for detecting previous instances. First WinMain calls CreateMutex to create a named mutex. Then it calls GetLastError to determine whether CreateMutex actually created a mutex or whether it simply returned the handle of an existing mutex with the same name. A return value of ERROR_ALREADY_EXISTS means another instance of the application has already created the mutex; that in turn causes WinMain to display an error message and shut down. Any other return value allows startup to proceed normally. Before terminating, WinMain calls CloseHandle to close the mutex handle. When the last instance of the application calls CloseHandle, the mutex's reference count drops to 0 and the system deletes it, freeing the resources allocated to it.

You can use a variation on the named-mutex method to limit the allowed number of instances of your application to a value other than 1. Suppose, for example, you'd like your users to be able to run up to five concurrent instances of your program. Just replace the named mutex with a named semaphore whose initial resource count is 5, then plug the following code into WinMain:

```
static char szSemName[] =
"MySemaphore";
HANDLE hSem;
.
.
.
// At startup
hSem = CreateSemaphore (NULL, 5, 5,
szSemName);
if (WaitForSingleObject (hSem, 0) ==
WAIT_TIMEOUT) {
MessageBox (NULL, "There are already
five instances of this application
running", "Error", MB_OK |
MB_ICONSTOP);
CloseHandle (hSem);
return -1;
}
.
.
.
// Before shutdown
ReleaseSemaphore (hSem, 1, NULL);
CloseHandle (hSem);
```

Semaphores are similar to mutexes, but unlike mutexes, semaphores maintain resource counts that indicate when all the objects they guard are in use. The call to CreateSemaphore creates a named semaphore with

```
int WINAPI WinMain (HINSTANCE hInstance, HINSTANCE hPrevInstance,
    LPSTR lpszCmdLine, int nCmdShow)
{
    static char szAppName[] = "MyApp";
    static char szWndClass[] = "MyWindowClass";
    static char szMutexName[] = "MyMutex";        // Use a unique name!
    WNDCLASS wc;
    HWND hwnd;
    MSG msg;
    HANDLE hMutex;

    // Get a mutex handle and fail the current application instance if the
    // mutex existed before the call to CreateMutex.
    hMutex = CreateMutex (NULL, FALSE, szMutexName);
    if ((hMutex != NULL) && (GetLastError () == ERROR_ALREADY_EXISTS)) {
        MessageBox (NULL, "Another instance of this application is running",
            "Error", MB_OK | MB_ICONSTOP);
        CloseHandle (hMutex);
        return -1;
    }

    wc.style = 0;
    wc.lpfnWndProc = (WNDPROC) WndProc;
    wc.cbClsExtra = 0;
    wc.cbWndExtra = 0;
    wc.hInstance = hInstance;
    wc.hIcon = LoadIcon (NULL, IDI_APPLICATION);
    wc.hCursor = LoadCursor (NULL, IDC_ARROW);
    wc.hbrBackground = (HBRUSH) (COLOR_WINDOW + 1);
    wc.lpszMenuName = NULL;
    wc.lpszClassName = szWndClass;

    RegisterClass (&wc);

    hwnd = CreateWindow (szWndClass, szAppName,
           WS_OVERLAPPEDWINDOW, CW_USEDEFAULT, CW_USEDEFAULT, CW_USEDEFAULT,
           CW_USEDEFAULT, HWND_DESKTOP, NULL, hInstance, NULL);

    ShowWindow (hwnd, nCmdShow);
    UpdateWindow (hwnd);

    while (GetMessage (&msg, NULL, 0, 0)) {
        TranslateMessage (&msg);
        DispatchMessage (&msg);
    }

    // Close the mutex handle so the system will know we're done with it.
    CloseHandle (hMutex);
    return msg.wParam;
}
```

FIGURE 3: *A named mutex can be shared among applications and provides a convenient means for an application to detect another instance of itself.*

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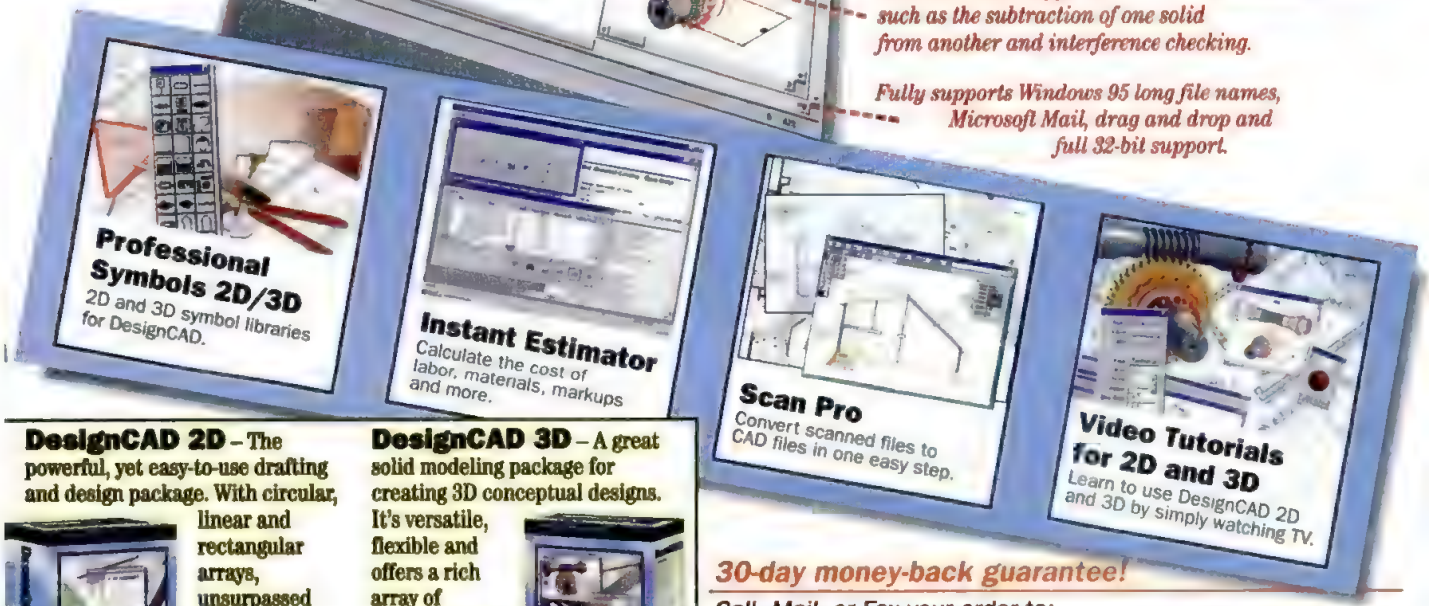

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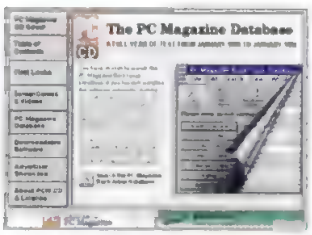

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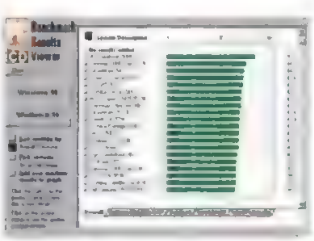

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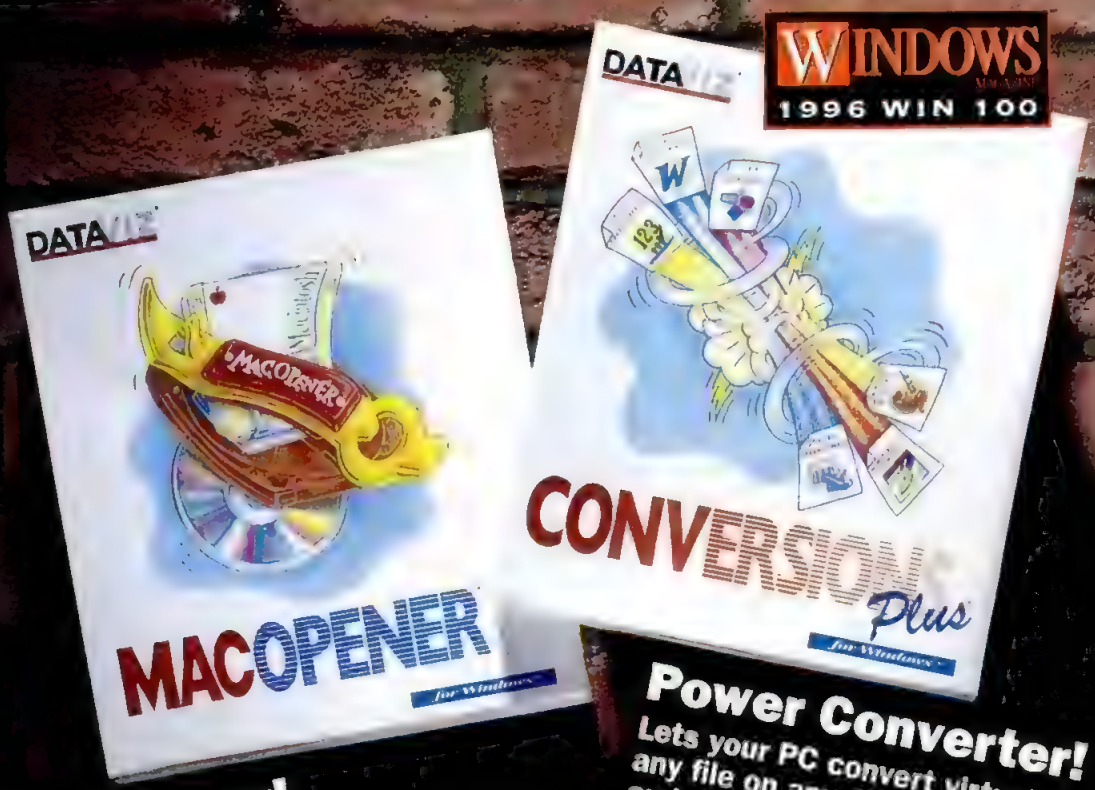

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an initial resource count of 5 if a semaphore of the same name doesn't already exist; otherwise, it returns the handle of the existing semaphore.

Calling WaitForSingleObject with the semaphore's handle decrements the resource count and returns WAIT_OBJECT_0 if the semaphore's resource count is nonzero. If the resource count is 0, WaitForSingleObject simply returns WAIT_TIMEOUT. Each instance of the application decrements the resource count with WaitForSingleObject when started and increments the resource count with ReleaseSemaphore before terminating. Thus, WaitForSingleObject returns WAIT_OBJECT_0 for the first five application instances. But if a sixth instance is started, WaitForSingleObject returns WAIT_TIMEOUT and the application quits. It's important to pass WaitForSingleObject a time-out value of 0 (parameter 2), or else calling it when the resource count is 0 will block the calling thread until either the time-out period expires or an existing instance of the application is terminated.

> The first three methods share an Achilles' heel: If you choose a name that's not unique, your app could be confused by instances of another app.

METHOD 4: SHARED MEMORY

Methods 1 through 3 share a common Achilles' heel: If the WNDCLASS name, atom name, or synchronization-object name you choose is not unique, your application might mistake other unrelated running applications for instances of itself. This is unlikely to happen if you choose your names carefully, but it's easier to rest comfortably when you know nothing is left to chance.

The fourth and final method we'll discuss is virtually bulletproof. It relies on shared memory in a DLL that is loaded into the address space of every instance of a given application. Inside that shared memory resides a variable that maintains a running count of the number of instances of the application that are running. The application increments the variable's value (which is initally 0) at startup and decrements it before shutting down. Restricting the number of concurrently running application instances is a simple matter of checking the count at startup and terminating if the count is greater than some predetermined value. The variable can be exported directly, or it can be exposed through exported DLL functions.

The source code listing in Figure 4 shows how this technique translates into code. Figure 4's WinMain function checks the instance count and terminates if it is not 0. The count is retrieved by calling the DLL's GetInstanceCount function. It is incremented with the IncrementInstanceCount function and decremented with DecrementInstanceCount.

The instance count is stored in the DLL in g_lInstanceCount, and g_lInstanceCount is declared between two pragmas that place it in a data segment named Shared. The name alone is not enough to make the data segment a shared segment; you must link the DLL with a

```
/SECTION:Shared,RWS
```

switch for the segment to be shared.

What would happen if g_lInstanceCount

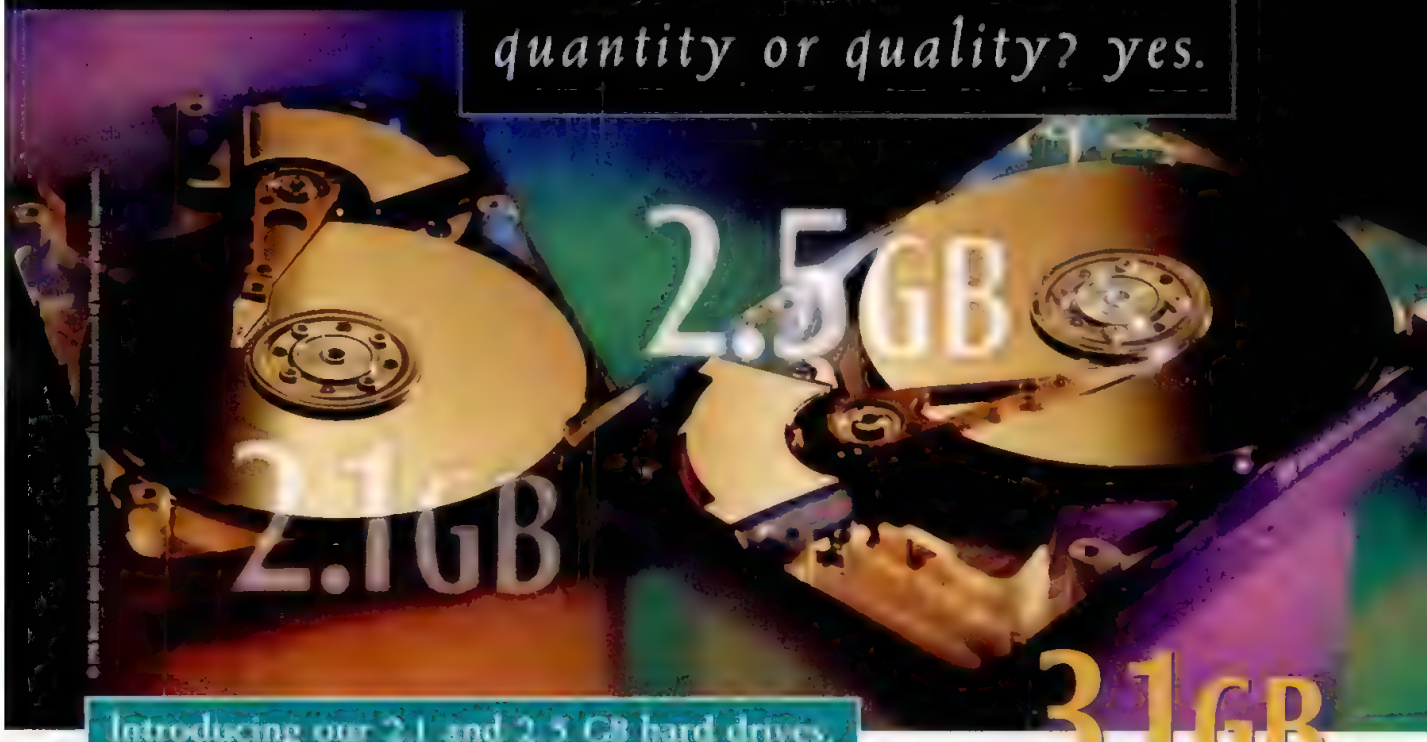
```
// DLL imports
__declspec (dllimport) LONG GetInstanceCount (void);
__declspec (dllimport) LONG IncrementInstanceCount (void);
__declspec (dllimport) LONG DecrementInstanceCount (void);
  .
  .
  .

int WINAPI WinMain (HINSTANCE hInstance, HINSTANCE
hPrevInstance, LPSTR lpszCmdLine, int nCmdShow)

{
    static char szAppName[] = "MyApp";
    static char szWndClass[] = "MyWindowClass";
    WNDCLASS wc;
    HWND hwnd;
    MSG msg;

     // Check the instance count and terminate if it's
     // nonzero.
    if (GetInstanceCount ())
    {
        MessageBox (NULL, "Another instance of this
        application is running", "Error", MB_OK |
        MB_ICONSTOP);
        return -1;
    }

    // Increment the instance count.
    IncrementInstanceCount ();

    wc.style = 0;
    wc.lpfnWndProc = (WNDPROC) WndProc;
    wc.cbClsExtra = 0;
    wc.cbWndExtra = 0;
    wc.hInstance = hInstance;
    wc.hIcon = LoadIcon (NULL, IDI_APPLICATION);
    wc.hCursor = LoadCursor (NULL, IDC_ARROW);
    wc.hbrBackground = (HBRUSH) (COLOR_WINDOW + 1);
    wc.lpszMenuName = NULL;
    wc.lpszClassName = szWndClass;

    RegisterClass (&wc);

    hwnd = CreateWindow (szWndClass, szAppName,
           WS_OVERLAPPEDWINDOW, CW_USEDEFAULT,
           CW_USEDEFAULT, CW_USEDEFAULT, CW_USEDEFAULT,
           HWND_DESKTOP, NULL, hInstance, NULL);

    ShowWindow (hwnd, nCmdShow);
    UpdateWindow (hwnd);

    while (GetMessage (&msg, NULL, 0, 0))
    {
        TranslateMessage (&msg);
        DispatchMessage (&msg);
    }

    // Decrement the instance count.
    DecrementInstanceCount ();
    return msg.wParam;
}
```

FIGURE 4: *This code uses an instance count stored in shared memory in a DLL to detect multiple application instances.*

Drivers' Ed

CHAPTER 6:

quantity or quality? yes.



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were not placed in a shared segment? Simple: Every subsequent application instance that links to the DLL would get its own copy of g_lInstanceCount, and GetInstanceCount would always return 0—no matter how many instances were running. Note that g_lInstanceCount is incremented and decremented with the Win32 InterlockedIncrement and InterlockedDecrement functions rather than with the C/C++ increment and decrement operators. This ensures that one thread won't try to increment g_lInstanceCount at the same time another thread tries to decrement it, as might happen when one instance is started at about the same time another instance is terminated.

When you compile and link the DLL, an import library containing references for the three exported functions is generated automatically. If you use the code Figure 4, link your application with the import library, so the .EXE will be able to see the functions in the DLL and the DLL will be loaded automatically when the .EXE is started.

It probably goes without saying, but I'll say it just to be sure: The shared memory technique can be used instead of a named semaphore to limit application instances to a number other than 1. To prevent more than five instances from running at once, you would check the count returned by GetInstanceCount and exit if it equaled 5. You could also modify the DLL to store the window handle of each application instance that has started. Then it would be a simple matter for subsequent instances of the application to activate an already-existing instance before shutting down by retrieving the window handle from the DLL and passing it to SetForegroundWindow.

THAT'S NOT ALL

Are there other methods for detecting multiple application instances in 32-bit Windows? You bet. For example, you could call SendMessage with an HWND_BROADCAST parameter, to broadcast a registered window message to all top-level windows, and then listen for responses. The key, of course, is to provide a handler for the registered window message that allows other running instances of the same application to identify themselves to the instance that sent the message. You could even work it so that the first instance brings itself to the foreground before the second instance shuts down by including a call to SetForegroundWindow in the message handler.

Broadcasting a message and listening for responses sounds a lot like DDE. Save for its complexity, DDE is an ideal mechanism for detecting multiple application instances and passing information between instances. Have you ever wondered how an MDI application written with MFC knows to open a document (and also knows what the document's filename is) when an icon for one of the application's file types is double-clicked? An object created from MFC's CFrameWnd or CMDIFrameWnd class is a DDE server that responds to WM_DDE_EXECUTE messages from the operating system shell by passing the document name referenced in each message to the application object, which in turn opens the document. In MFC 4.*x*, you can see how it works by looking at the source code files Winfrm.cpp, Appui.cpp, and Docmgr.cpp. The key functions to look at are CFrame Wnd::OnDDEExecute, CWinApp::OnDDECommand, and CDocManager::OnDDECommand. You can adapt the code in these functions to add similar functionality to SDK applications, if you wish.

Are there other Windows programming topics you would like to see addressed in this column? If so, drop me a line in the Power Programming section of the PC MagNet Programming forum on CompuServe. My CompuServe ID is 72241,44. From the Internet, send mail to *72241.44@compuserve.com*. □

Jeff Prosise is a contributing editor of PC Magazine. *His new book,* Programming Windows 95 with MFC, *was recently published by Microsoft Press.*

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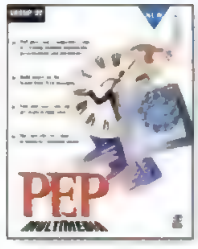

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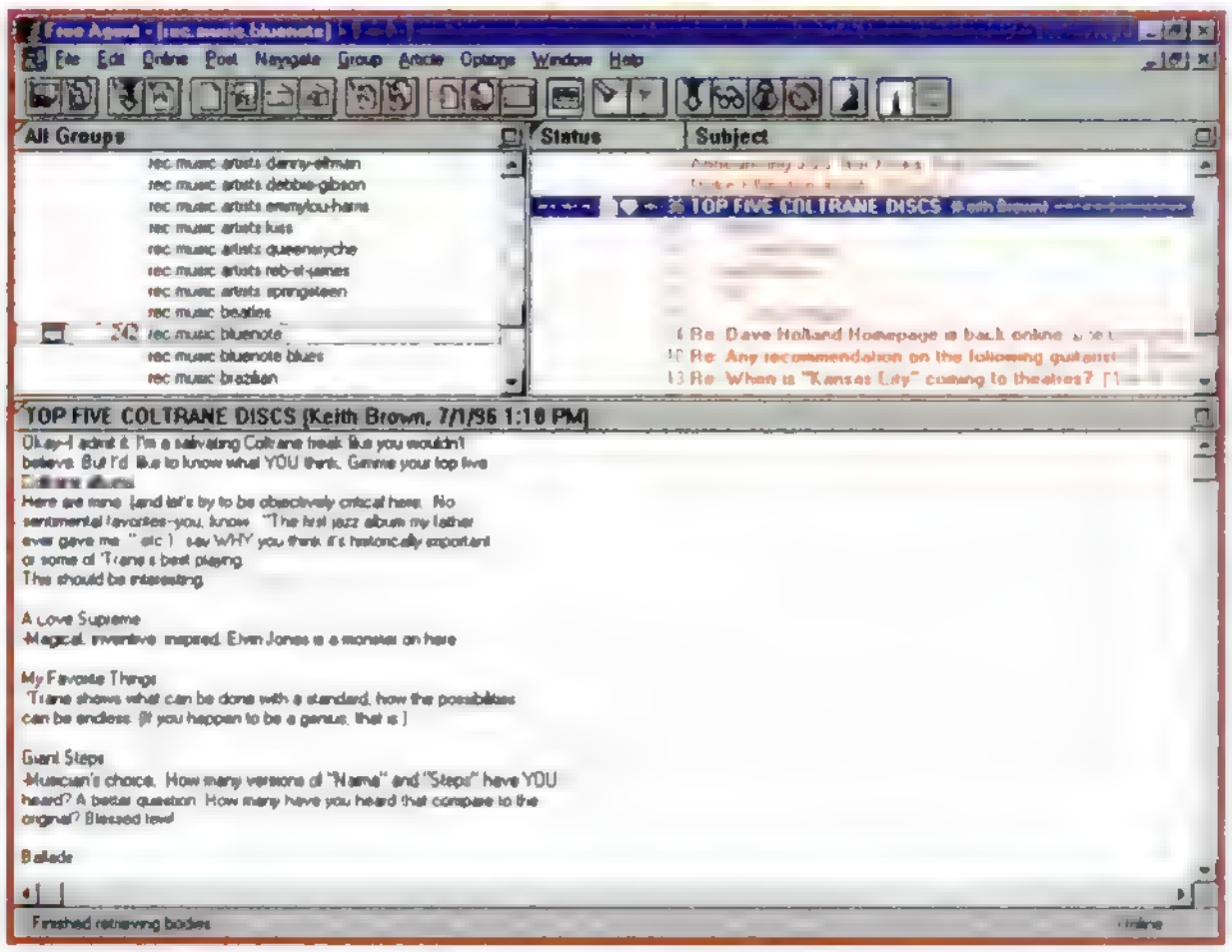
The Usenet news system consists of five main components: the newsgroup articles, the client software, the server software, the TCP/IP distribution medium, and the NNTP protocol, which glues all the other components together. The newsgroup articles and client software are controlled by the end users, and the server software and TCP/IP distribution medium are managed by local site administrators and Internet Service Providers (ISPs).

NEWSGROUPS AND ARTICLES

Newsgroups contain information spanning most imaginable subjects—as well as some that are hard to imagine—from business and world news to cooking to computer programming. To keep information organized, newsgroups are named using a hierarchical structure that denotes their content type. Each name consists of a series of period-separated identifiers, ordered from most general to most specific, that together describe the newsgroup's area of discussion. At the highest level, such designations as *rec* and *comp*, for example, refer to recreational and computer-related topics, respectively. Currently there are approximately 600 top-level categories. Each additional identifier narrows the focus of the newsgroup's subject matter. So *rec.pets.cats*, for example, contains information about pets, specifically cats.

Although newsgroup articles are typically text messages, they can also contain encoded binary files. A commonly used method of transmitting binary files is to *uuencode* them. A uuencoded message starts with a *begin* line that contains the filename and file protection information, and it ends with an *end* line. In between is an ASCII representation of the binary file, each line starting with an uppercase *M*. A very large uuencoded file would make a very long article, so most uuencode utilities split large files into multiple smaller files. Each part is posted to the newsgroup as a separate article; to reassemble the encoded file, you need all the parts, plus a *uudecode* utility.

In addition to text messages and encoded binary files, there is another type of newsgroup article, a control message. This is a special-format message that is interpreted by the server software. Control messages instruct a server to create, delete, and modify newsgroups; they can also order a server to cancel a specific article when its author wants to remove the posting. In short, control messages instruct news servers to take specific actions, and that makes automated management of the Usenet news system possible.



News readers give you access to the approximately 15,000 newsgroups currently in existence, and all of the postings they contain.

END-USER SOFTWARE

The end user uses software called a *news reader*. This software is capable of establishing a connection to a Usenet news server using the NNTP protocol. The dialog between client and server allows the news reader to obtain a list of all available newsgroups, retrieve the subject headings of articles within newsgroups, and retrieve the news articles.

The news reader is also responsible for managing the end user's "subscriptions." Unlike conventional magazine subscriptions, Usenet news subscriptions are known only to the recipient (the end user's news reader), not to the delivery agent (the news server) nor to any individual on the Internet. You don't have to subscribe to a newsgroup to read its contents, but a subscription list gives the end user a much more manageable subset of the approximately 15,000 newsgroups currently in existence. There is virtually no limit to the number of newsgroups to which you can subscribe.

Other common capabilities of the news reader include posting, threading, and decoding messages. *Posting* is the action of sending a message into the Usenet news-distribution system. *Threading* visually organizes newsgroup articles by subject, grouping responses to a given article directly underneath the original posting in the message listing and allowing you to read through all the articles on a particular topic as a group. Threading makes it easier to follow a given subject, as newsgroups always have many different discussions going on at the same time. *Decoding* is the action of converting the ASCII contents of an article into a binary

```
Path: newshub.csu.net!csun.edu!usenet
From: bernie <hbund847@huey.csun.edu>
Newsgroups: rec.pets.cats
Subject: Re: trimming claws
Date: Fri, 24 May 1996 23:15:35 -0700
Organization: California State University, Northridge
Lines: 12
Message-ID: <31A6A587.583E@huey.csun.edu>
```

FIGURE 1: *A typical message header for a newsgroup article posting includes all of the above elements.*

file, such as an image or a program, that you can then access on your computer.

SERVER SOFTWARE

The server software is responsible for accepting connections from news readers and other news servers using the NNTP protocol. In the case of news readers, the server software provides the information that the end user requests.

In addition to serving articles and newsgroup listings to news readers, the news server is responsible for the management and operation of the Usenet news system. A local news server accepts connections from another server—usually referred to as its feed site—in order to receive new articles from other sites. It also initiates a connection to its feed site to relay locally generated news articles for distribution within the Usenet news system.

Once a news server has received new articles from its feed site, it stores them in subdirectories whose pathnames match the hierarchical nomenclature of the newsgroups, with the periods replaced by slashes. Articles from the group rec.pets.cats get stored in the rec/pets/cats subdirectory, under a spool directory. Each article is stored as a separate file in its appropriate newsgroup directory; the article's filename is derived from a locally maintained serial number unique to each newsgroup.

The news server also updates a local file, usually called *articles*, which contains the first and last article numbers (the locally generated serial numbers) currently available for each newsgroup. When a news reader requests a newsgroup listing from the news server, all the server has to do is transmit a copy of its articles file, from which the news reader can derive the newsgroup names and the numbers of the first and last locally available articles in each newsgroup.

Cleaning up old articles is another important task of the news server software. Although an article can contain header information that suggests when the specific article should expire and be removed from the local system, the local systems administrator is free to impose other global article-expiration policies. For example, a given site may decide to keep all articles for a week, or it may keep all articles for two weeks except those from newsgroups belonging to the *alt* category, which tends to be very busy and large in volume. The systems administrator may want those articles to expire after three days. Once an article reaches its expiration date, as derived from either its headers or the site-imposed expiration policy, the news server deletes the article from its local storage disks.

PUTTING IT ALL TOGETHER: NNTP

At the heart of the Usenet news system is its communications protocol, NNTP. Like SMTP (Simple Mail Transfer Protocol) and HTTP (Hypertext Transfer Protocol), NNTP defines a command set, by means of which servers and clients (in this case, news servers and news readers) communicate with each other. It also defines the content and significance of message headers. Its full description is available in RFC 977 (NNTP), RFC 1036 (Standard for Interchange of Usenet Messages), and RFC 822 (Standard for the Format of ARPA Internet Text Messages). RFC (Request For Comments) documents are the common way of disseminating proposed Internet protocols and standards.

A Usenet news message is constructed in the same way an Internet mail message is. It contains a header section, whose contents are similar to the headers of ordinary e-mail messages, and a body section, which contains the actual message content.

> Usenet offers an efficient way to distribute messages to the Internet community, but the content of some messages has become the subject of bitter debate.

The following message headers are required: *from*, the sender of the message; *date*, the time and date the author posted the message; *newsgroups*, the newsgroup or group of newsgroups to which the message belongs; *subject*, the message subject supplied by the author; *message-id*, the domain from which the message originated (a unique message identifier followed by @full_domain_name); and *path*, the series of systems through which the message passed before it reached the news server's local system. Some important optional headers are *expires*, the suggested message-expiration date; *control*, an indicator that the message is a control message (as described above); *organization*, the name of the organization where the message was generated; *approved*, a designation required by moderated newsgroups; and *lines*, a line count of the message content. A message header typically looks like the one shown in Figure 1.

NNTP operates on TCP/IP port 119; therefore, making a telnet connection to port 119 on a remote system could allow you access to that system's news server. Note, however, that site administrators have the ability to restrict access to the news server to authorized users. If you are able connect to one, then the NNTP command set is available (see Figure 2).

After making a connection to a news server, you could issue a *group rec.pets.cats* command to select the rec.pets.cats news-

```
help
100 Legal commands
  authinfo user Name|pass Password
  article [MessageID|Number]
  body [MessageID|Number]
  date
  group newsgroup
  head [MessageID|Number]
  help
  ihave
  last
  list [active|newsgroups|distributions|schema]
  listgroup newsgroup
  mode reader
  newgroups yymmdd hhmmss ["GMT"] [<distributions>]
  newnews newsgroups yymmdd hhmmss ["GMT"] [<distributions>]
  next
  post
  slave
  stat [MessageID|Number]
  xgtitle [group_pattern]
  xhdr header [range|MessageID]
  xover [range]
  xpat header range|MessageID pat [morepat...]
  xpath xpath MessageID
```

FIGURE 2: *Should you have authorization to access a news server, the NNTP command set is available to you.*

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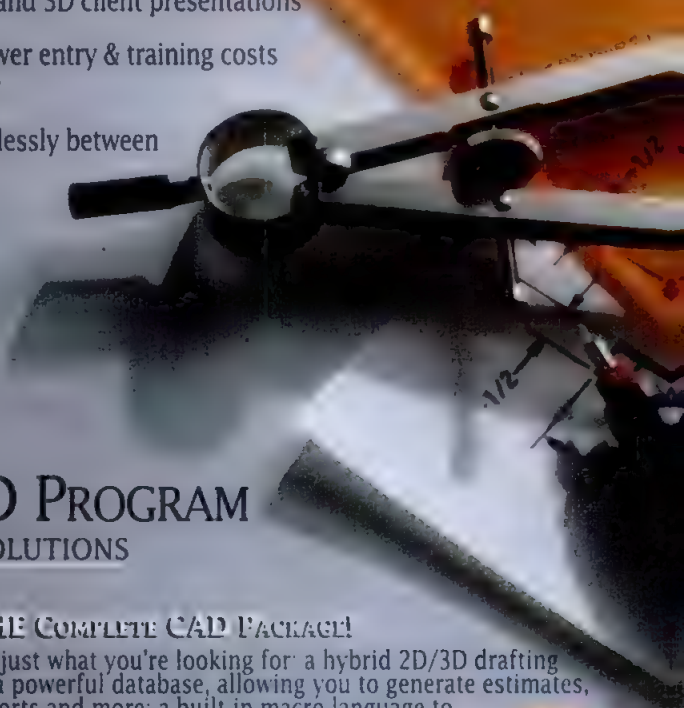

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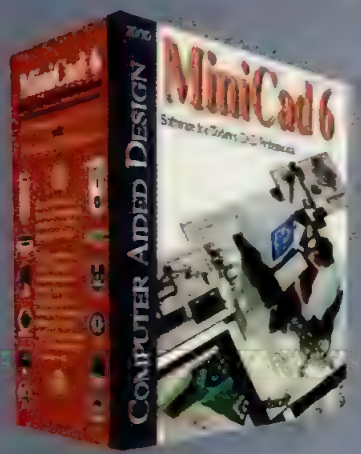

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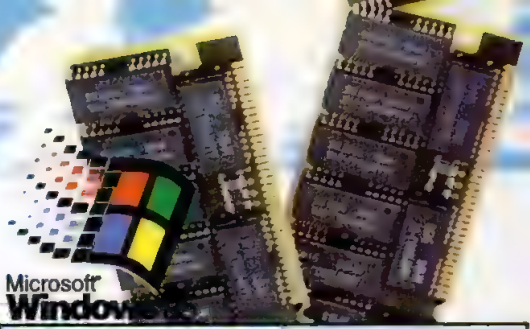

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	70ns	36.00	Call
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group, followed by a *next* command to display the next available message ID, and then an *article* command to display the message headers and body (see Figure 3). Using this type of dialog, a news reader retrieves and displays newsgroup and message listings as well as the articles themselves. Other commands are meaningful only to news servers. In a similar way, a feed site makes a connection to the sites it feeds and issues commands to determine whether it should send its new articles.

A MESH NETWORK

Distribution of Usenet news articles is efficient thanks to a combination of the Usenet design and the news server software intelligence. There is no centralized organization, group, or system responsible for distribution of news articles. All news servers everywhere are responsible, to a greater or lesser degree, for the success of the system.

When a user on the Internet posts a message, the news server at the local site adds the message ID of the new article to a spool file. Usually the name of this file is either the IP address or the name of its feed site (note that a site can have one or several feed sites). At a given interval (for example, every 15 minutes), the news software opens this spool file and makes a connection to its feed site or sites. For each message ID in the spool file, the news server asks its feed site whether the feed site has already received an article with a matching message ID (according to the standard, message IDs should not be reused for two years). If the answer is yes, the news server skips that message ID and proceeds to the next one in the spool file; if the answer is no, the news server transmits the article. The feed site in turn adds the message ID of the newly received article to the spool file for each of its feed sites and propagates the new article in this manner.

This news-propagation method is referred to as a *push method*, because the local server initiates the dialog with the feed site when the server has new messages to transmit. The push method is very efficient, because it deals with only new messages: The exchange of information between news servers always refers to new message IDs, and only new messages are transmitted.

An alternative way to propagate news is through a *pull method*, in which a site contacts its feed site and asks if there are new articles for a given newsgroup, just as a news reader queries its news server for a listing of new messages in a newsgroup. Because the feed site's news server has to check the contents of the newsgroups to locate new messages as requested by the local site, the remote server has to do a considerable amount of processing, which results in a very inefficient way of propagating new messages, especially if there aren't any—in which case the search is for naught.

NETIQUETTE AND NEWSINESS

Usenet news offers an efficient way to distribute messages to the Internet community. The content and usefulness of these messages, however, have become subjects of often-bitter debate. Some people have found newsgroups, many of which are unregulated, to be a viable means of distributing objectionable—and sometimes illegal—material, the most notorious example being child pornography.

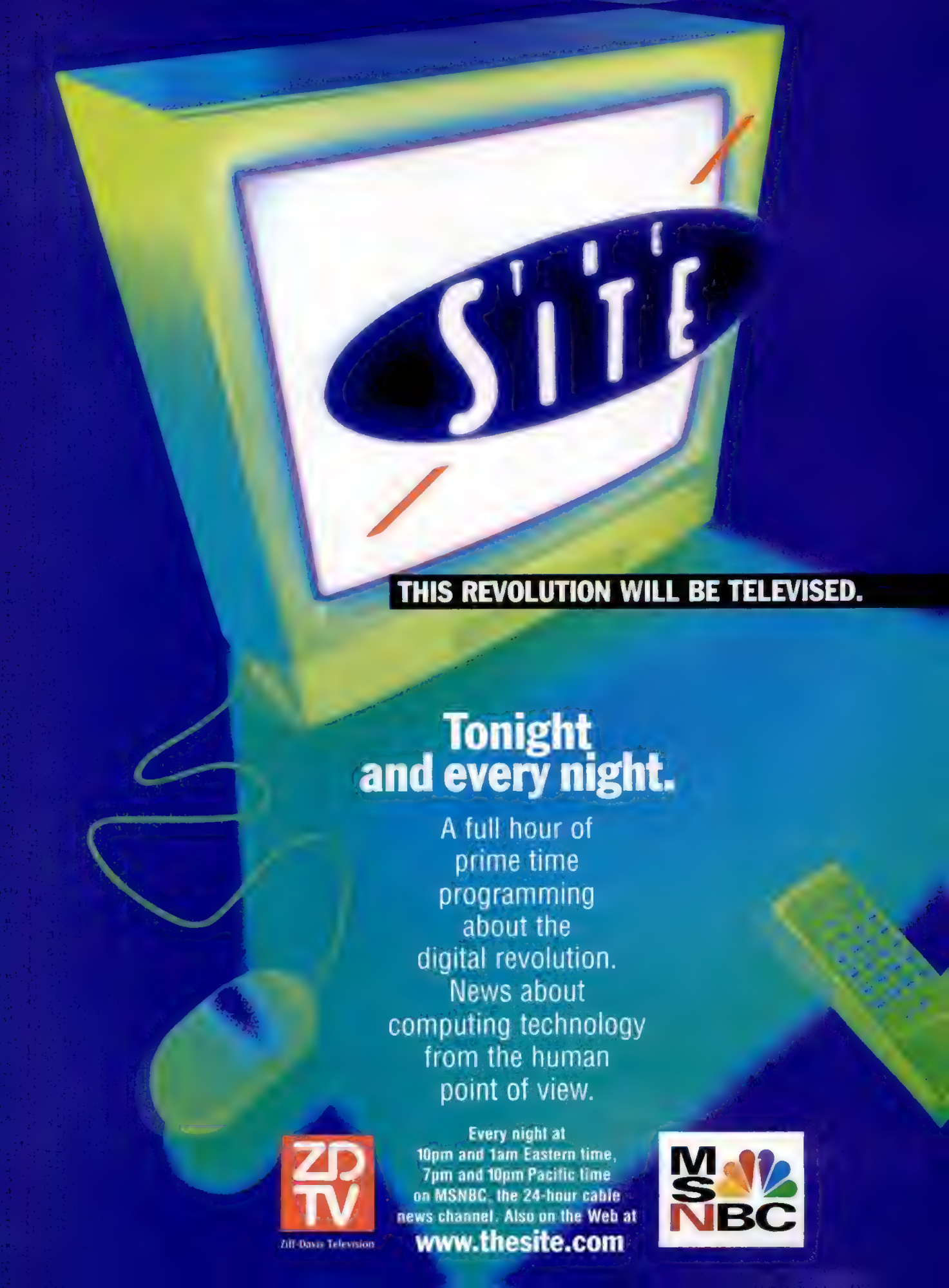
The Internet community tries informally to regulate the contents of its newsgroups through what is now termed "netiquette," or proper behavior in newsgroups. When someone posts an article that a reader finds objectionable, the poster may get "flamed," Internet parlance for receiving a slew of messages that seldom fall short of verbal abuse. A moderate amount of flaming deters people from repeating objectionable behavior, but because excessive flaming would achieve little besides detracting from a newsgroup's objectives, the Internet community by and large views flaming as inappropriate and discourages its use.

Excessive flames and illegal material aside, there is a wealth of information in newsgroups that can help you keep up-to-date with your music or movie idols or provide information for a term paper. Many programmers use newsgroups to discuss programming techniques or request assistance from industry experts who routinely participate in newsgroup discussions. For them, as for many others, Usenet news is a valuable source of information. □

```
group rec.pets.cats
211 1355 30461 56971 rec.pets.cats
next
223 55853 <4o6742$3mr@news.ios.com> Article retrieved; request text separately.
next
223 55854 <31A6A587.583E@huey.csun.edu> Article retrieved; request text separately.
article
220 55854 <31A6A587.583E@huey.csun.edu> article
Path: newshub.csu.net!csun.edu!usenet
From: bernie <hbund847@huey.csun.edu>
Newsgroups: rec.pets.cats
Subject: Re: trimming claws
Date: Fri, 24 May 1996 23:15:35 -0700
Organization: California State University, Northridge
Lines: 12
Message-ID: <31A6A587.583E@huey.csun.edu>
References: <4nntag$a8t@newsbf02.news.aol.com> <319F80BF.346F@direct.ca>
<4nqisf$gsq@eccdb1.pms.ford.com> <4o5h6p$bjp@bmerhc5e.bnr.ca>
NNTP-Posting-Host: s253n045.csun.edu
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Mailer: Mozilla 2.01 (Win95; I)

Winnie Leong wrote:
>
> Just out of curiostiy, what will happen if the claws
> are not trimmed. I know they'll get long and sharp.
> But if the cat only scratch the srcatching post,
> that should be O.K., shouldn't it?

If a cat is polydactyl, like my Blue, the claws that aren't being worn
out properly will curl into the pad. Scratching pads help sharpen claws,
but not every claw get the same amount of wear and tear.

Bernadette
```

FIGURE 3: *When connected to a news server, you can issue the* group, next, *and* article *commands to receive newsgroup and message listings, in addition to the articles themselves.*

Sean González, a regular contributor to the Internet Tools column, is a project leader for the Internet Working Solutions Group at Information Access Center in Boston, MA.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User-to-User

By Neil J. Rubenking

Shut Down Windows 95 To DOS

I read "Exiting from Windows 95 to DOS," in the User-to-User column of March 26, 1996, and it seems Microsoft completely misrepresented the situation. You most certainly can exit from Windows 95 to DOS. Also, your discussion of exiting Windows 95 and restoring the screen with MODE CO80 was not complete. I completely disassembled WIN.COM months ago and published my findings on my Web page, located at http://ourworld.compuserve.com/homepages/NIFTY_TOOLS.

You can exit to DOS only if COMMAND.COM is loaded before WIN.COM at startup. The system needs to load COMMAND.COM for processing AUTOEXEC.BAT, so as long as your system has an AUTOEXEC.BAT file, it will load COMMAND.COM at startup. As a bonus, when COMMAND.COM is preloaded, Windows 95 doesn't have to execute it for each DOS box.

WIN.COM loads the Windows 95 graphical user interface and transfers control to it. When Windows 95's GUI shuts down, control returns to WIN.COM, which displays a bitmap stating that it is OK to turn off your PC. It then continues executing in a tight loop that swallows all keystrokes, giving the impression that you must reboot your PC. But if the shutdown bitmap (c:\windows\logos.sys) can't be found, WIN.COM displays a text message and drops to the familiar command prompt! I verified that renaming or removing this file had no adverse effects anywhere else in Windows 95. If you follow these steps, you can enable exit to DOS on your Windows 95 system:

- *Create or edit an AUTOEXEC.BAT file. It should contain at least the following lines:*

```
path c:\windows;c:\windows\command;
➥c:\dos
win
```

If AUTOEXEC.BAT already exists on your system, add "win" as its last line.

- *Eliminate the shutdown bitmap. Use Explorer to delete or rename the file c:\windows\logos.sys. Optionally delete or rename c:\windows\logow.sys, too (the "Please wait" screen).*
- *Force booting to the command prompt. While still in Explorer, locate the file c:\msdos.sys. If you don't see it, select Options from the View menu, choose Show All Files, and click on OK. Right-click on the filename and select Properties from the context menu. Deselect the Read-only and Hidden check boxes and click on OK. Open the file with Notepad, insert the line* `BootGui=0` *in the [Options] section. Save the file and restore its Read-only and Hidden properties. This makes the system boot to a command prompt, but* `win` *in the last line of AUTOEXEC.BAT starts Windows 95. Restart your computer.*

Now, when you choose "Shut down the computer" from the Shut Down Windows dialog, you'll actually exit to DOS. To return to Windows 95, just type WIN.

GARY TESSLER, *San Ramon, California*

PC MAGAZINE: As we noted in the earlier article referenced here, Microsoft's stated position is that after you exit from Windows 95, the system is in an unstable state. My previous investigation seemed to support this statement; I could reach a DOS prompt on some systems but not others. After the application of Mr. Tessler's clear instructions, however, all of these systems successfully exited to DOS and returned to Windows 95 repeatedly and with no difficulty. The inconsistencies in earlier results were apparently caused by differences in configuration. Once you've applied this tip, you'll have no doubt that DOS is still alive.

The instructions above do assume that your Windows 95 directory is c:\windows. Naturally, if Windows 95 is installed in a different directory, you'll have to replace every instance of c:\windows with that directory. Also, to reveal DOS in all its glory, you can add the line `Logo=0` to the [Options] section of msdos.sys. Now the Windows 95 opening logo will not hide the processing of CONFIG.SYS and AUTOEXEC.BAT at startup.

Add Modem Tracking To Windows 95's System Monitor

While investigating the Windows 95 System Monitor applet, I found that a monitor for modems does exist. It won't show up on System Monitor's Add Item list, however, unless you do the following: First,

HIGHLIGHTS

HARDWARE What to do when a hardware vendor claims the operating system vendor should supply a full-capability driver and vice versa. *Page 344*

OPERATING ENVIRONMENTS Windows 95's Winsock DLL may interfere with the one required by your Internet service provider. Find out how to thwart this potential conflict. *Page 350*

SPREADSHEETS A simple VBA program can ensure that debit values entered into your worksheet will be negative numbers. *Page 352*

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See index, page 344

open the Modems applet in Control Panel, click the Properties button, select the Connection tab, press the Advanced button, and check the "Record a log file" box. Then run any 32-bit communications program. (I'm not sure if you actually need to be connected.)

Now if you choose Add Item from System Monitor's Edit menu, you'll see an option for your modem. Selecting this option will let you monitor the number of bytes sent and received over the modem. I haven't found this feature documented anywhere, so I wonder if there are any other existing monitors out there that we just don't know about.

RAY B., *via the Internet*

PC MAGAZINE: You'll find the System Monitor applet in the System Tools submenu of the Accessories submenu of the Programs menu. If you haven't used it before, give it a try! The Line Charts view is probably the most informative, as it provides a moving histogram of each monitored item, sampling the values at a user-defined interval (from once a second to once an hour). Figure 1 shows the System Monitor with only the modem items selected.

When you choose Add Item from the Edit menu, you get a dialog listing several categories of items on the left, and items within those categories on the right. The category list will include File System, Kernel, and Memory Manager, and it may also include one or more network-based categories. But if you configure your modem as described here, and if the modem is currently connected using a 32-bit communications program, an additional category will appear with the modem driver's name. Once you've selected the bytes received and sent items in this category, those settings will remain in your System Monitor even when the modem is not in use. (Be sure to keep in mind that you can only monitor modem usage by 32-bit programs; 16-bit programs will be ignored.)

Programmers, take note: The performance statistics reported by System Monitor are maintained right in the Windows 95 Registry. If you launch the REGEDIT program and navigate to HKEY_DYN_DATA\PerfStats\StatData, you'll see a long list of values that correspond to items available for tracking by System Monitor. (The names and descriptions for these items are stored elsewhere in the Registry, at HKEY_LOCAL_MACHINE\System\CurrentControlSet\control\PerfStats\Enum.) You could watch these performance values changing by pressing F5 repeatedly in REGEDIT (refreshing the display). System Monitor, however, provides a much more readable view of the same data, without the danger of accidentally changing some essential item in the Registry.

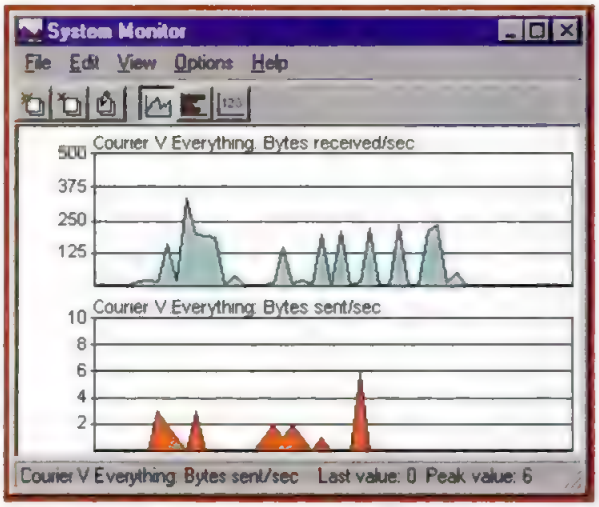

FIGURE 1: *The Windows 95 System Monitor has the hidden ability to monitor the modem activity of 32-bit programs.*

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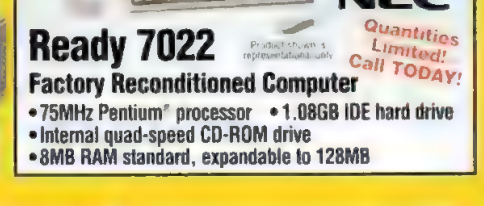

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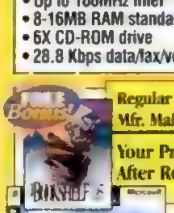

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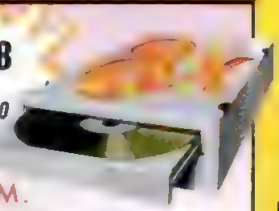

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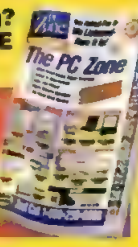

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As an American missionary living and working in rural East Africa, I run a large mission compound, using my notebook computer and portable ink jet printer to assist me. I used to be frustrated with the tendency of the ink from the printer to smear and run when wet. A single drop of water could ruin a notice posted near a sink or water fountain or where it might be touched by rain. On a hunch, I tried applying varnish to a page printed on the ink jet, and to my delight, I discovered that the water-soluble ink did not dissolve in the varnish and so did not smear when I painted it. Pages painted or sprayed with clear varnish are water-resistant, and we can even glue them to wood for use as all-weather signs.

DAVID A. SMITH, *Shinyanga, Tanzania*

PC MAGAZINE: That's a great tip, though I suspect most users won't be able to set up a painting station next to the coffee maker or the postage machine in the mailroom. A similar solution would be to use a fixative spray, usually available at art-supply stores. If you do use a spray coating, a large cardboard box can be used as a spray box to prevent the spray from getting onto surfaces where you might not want it.

And though they may be more expensive initially, vinyl page protectors (such as those used to hold pages in a three-ring binder) can also provide excellent protection. These pouches have the added advantage that they are reusable, so you can simply slip out the old notice and replace it with an updated one in just seconds—and at no additional cost.

—Alfred Poor

Paint It Black

I used to be able to play Video for Windows files (.AVI) under Windows 3.1, but now that I've upgraded to Windows 95, those files don't work properly. The picture either freezes or goes black, and there is a ticking sound that doesn't stop until I restart Windows 95. I've tried reinstalling Windows 95, but that didn't help, and Microsoft technical support couldn't resolve the problem either. Do you have any suggestions?

JIM ESPEJO, *Lithonia, Georgia*

PC MAGAZINE: Multimedia problems can be exceedingly frustrating because so many pieces are involved. I try to solve them by simplifying the problems as much as I can.

You might try Windows 95's own troubleshooting assistance first: Select Help from the Start Menu, choose "Troubleshooting," then "If you have a hardware conflict." Follow the instructions to determine a possible hardware conflict.

If that doesn't help, I'd start by switching to the vanilla VGA graphics driver for Windows 95. Make sure that no programs are being automatically loaded on the LOAD= or RUN= lines of your WIN.INI file or in any other .INI files, and that all other applications are closed. Alternatively, you can restart your system, press F8 when you see "Windows 95 is starting..." and select "Safe Mode" from the menu. This procedure will cause your system to use plain VGA mode without actively changing your graphics driver and will also omit unnecessary drivers.

Next, try temporarily removing interface cards that control nonessential peripherals. If the problem persists, try a different CD-ROM interface, a different sound card, or some other piece of the puzzle until you find a configuration that works. From that point on, you can start adding components back until the

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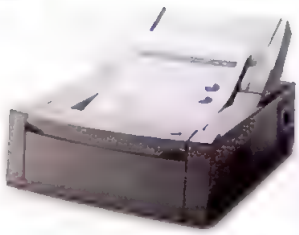

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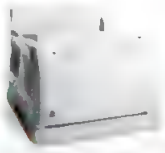

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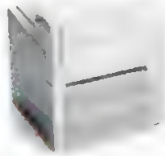

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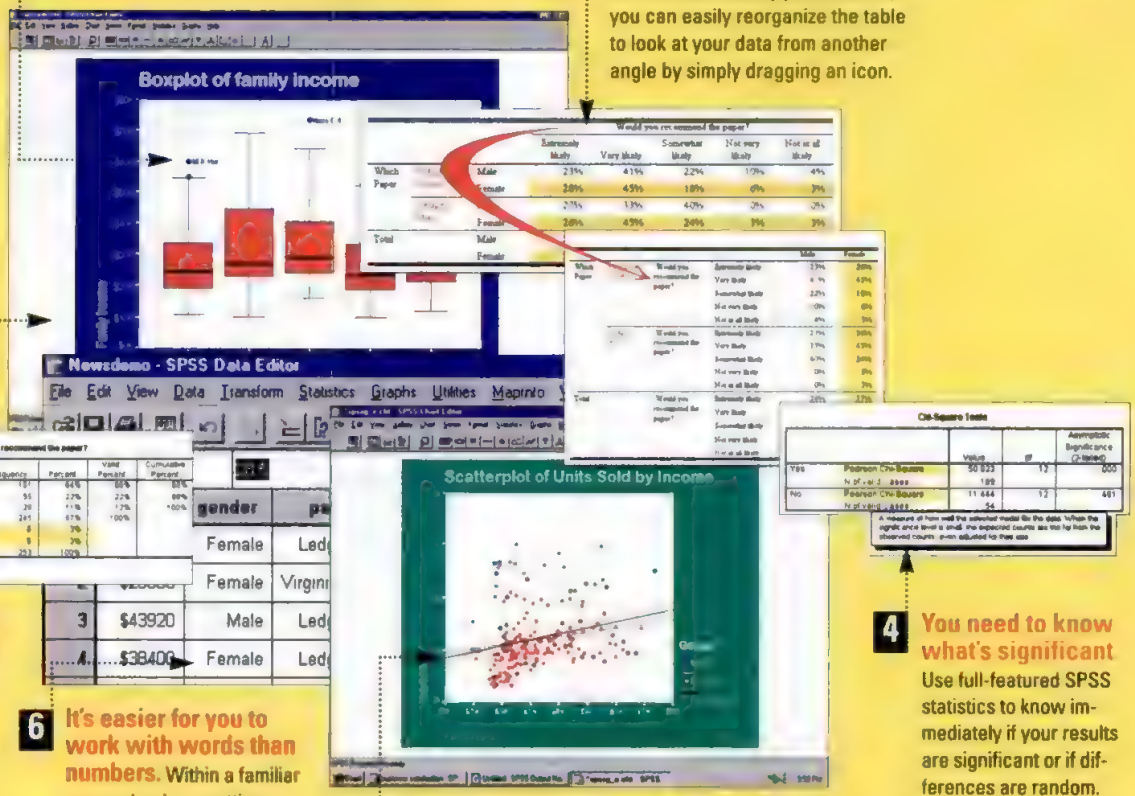

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problem reappears—that should provide a clear indication of what parts are at the root of the trouble.—*Alfred Poor*

Old News Is Good News

I have a color ink jet printer and a color scanner that came with software to make color copies. Under Windows 3.1, I could specify multiple copies when using this program, and everything worked great. Then I upgraded to Windows 95, which comes with its own driver for my printer. Unfortunately, the new printer driver does not have a multiple-copy feature. Some programs I use—such as Microsoft Publisher—include a built-in multiple-copy feature, but the copier software for the scanner doesn't.

The printer manufacturer feels Microsoft should provide that feature in its driver, while Microsoft says it only provides a basic driver, and the printer manufacturer should supply a more sophisticated driver with a multiple-copy feature. Is there some other way to resolve this, since each vendor feels the other should solve my problem?

PAUL GROSHIER,
Palm Desert, California

PC MAGAZINE: Your solution may be as close as your original printer-driver disks. Although I don't know the specific make and model of your printer, I've found that you can install Windows 3.*x* drivers in Windows 95, and they will work.

Choose Settings from the Start button, then Printers. Then select the Add Printer icon. When you are asked to select a printer, click on the Have Disk button and put your Windows 3.*x*–driver disk in the floppy disk drive. You can then choose your printer from the list of printers found for that driver. From then on, you can set up the printer the same way you'd set up a printer with a Windows 95 driver. The only time you'll see any difference is when you go to the Setup options for that printer, where you'll find a Windows 3.*x*–style dialog box instead of the Windows 95–style windows. You should find your familiar "Number of Copies" option on the older driver, however, so you can go ahead and make multiple copies.

Note that some Hewlett-Packard printers won't let you install Windows 3.*x* drivers in this way. Instead, you have to run a setup program from the floppy disk. This should still work for Windows 95, so just follow the directions for the Windows 3.*x* installation.

You may want to have both the old and new drivers installed on your computer. Even though the new one doesn't have the number-of-copies feature you want, it may have other useful features, such as color correction or other output controls. With both installed, you can then choose the most appropriate driver for the software you are using at the time.—*Alfred Poor*

Perplexed about Ports

Manufacturers seem to give minimal instructions about the BIOS used in their systems, especially in terms of the CMOS settings. How is someone supposed to decide how to configure "IDE HDD Block Mode" or "PCI Concurrency"? Is there any information available to help users make these decisions?

One setting about which I'm particularly concerned is the choice between EPP and ECP for my parallel port. What advantages does each offer, and what are the differences between them? Will the wrong setting damage an older printer or other peripheral that doesn't conform to the specification?

G.D. PETRIE, *Orleans, Ontario, Canada*

PC MAGAZINE: Each manufacturer gets a customized version of the BIOS for its systems, so there's no single source that can cover all the possible variations you might encounter. Some books are available with information on CMOS settings, but I'd suggest that you start by contacting the BIOS manufacturer itself to see what technical information might be available. In general, not much can be gained from tweaking the advanced settings. Chances are good that you won't notice any gains, and it is possible to make changes that can either slow down or disable your system. In general, my recommendation is that if you don't know for certain what a particular CMOS setting does, don't change it.

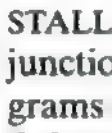
The EPP and ECP choices in particular, however, are exceptions; using these ports can create a noticeable change in printer performance. In the first place, these are high-speed parallel-port configurations, defined as part of the IEEE 1284 specification. The standard Centronics parallel port is capable of about 40- to 300-Kbps transfer rates, but EPP and ECP ports can move data at speeds of up to 2 Mbps. This can make a huge difference in how long it takes your computer to send print jobs to your printer.

The other advantage of the these new port specifications is that they support bidirectional communications between the printer and the computer. With the Centronics port, there were a few signals that the printer could send to the computer—on- or off-line, paper out—and manufacturers got pretty clever in making the most of this limited communications channel. But the ECP and EPP ports allow the printer to be more communicative, making it possible for a computer to query some laser printers to find out their current configurations.

Fortunately, the new parallel-port specification is backward-compatible, and you won't do any damage to older devices when connecting them to ports in this mode. You only have to change back to the standard parallel-port configuration should your printer or other device have problems communicating reliably with the faster port. As for the differences between the two variations, EPP and ECP are about the same in terms of performance. The ECP version was developed by Hewlett-Packard and Microsoft in advance of the IEEE specification. Unless you have a device that specifically requires an ECP connection, you will want to go with the EPP setting as the default choice.—*Alfred Poor*

OPERATING ENVIRONMENTS

Uninstallers and Windows 95



A friend running Windows 95 told me uninstallers such as PC Magazine's *INCTRL2 utility are unnecessary, because Windows 95 is able to uninstall programs itself. If true, this would be a major reason for me to move to Windows 95 for my production machines. Does Windows 95 really make uninstallers obsolete?*

WISU KAPUSKAR, *via the Internet*

PC MAGAZINE: Windows 95 includes an Add/Remove Programs applet in its Control Panel. This applet tracks the installation and mediates the removal of any program that has been specifically written to be installed and uninstalled by it. In other words, the solution to uninstallation requires that the program participate in the process. If the program doesn't uninstall itself completely, Windows 95 can't help, so uninstall programs are not obsolete.

There are a number of uninstall utilities specifically designed for Windows 95, including some that wait in the background and pop up to track programs named SETUP or INSTALL. Using one of these programs in conjunction with the built-in Add/Remove Programs applet will give you a second line of defense in case the program doesn't uninstall completely. The INCTRL2 utility is a 16-bit program, however, and does not have access to the essential Windows 95 Registry. If you want to use INCTRL2 despite this limitation, run it in its two-phase mode. After installing the program using the Add/Remove Programs applet, run INCTRL2 again to get a report.—*Neil J. Rubenking*

Windows 95 Vs. Winsocks

PC MAGAZINE: Quite a few readers have written in about a strange problem. They'd install an Internet access program under Windows 95, and it would work fine. But when they restarted the computer and tried to log on to the Internet, the Internet access program would gripe that it found the wrong version of

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VISA DISCOVER

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WINSOCK.DLL. Sure enough, the access program's WINSOCK.DLL had been overwritten by the namesake file supplied with Windows 95 itself.

This isn't a sinister ploy by Microsoft. Rather, it's an attempt to keep your system's essential files safe from harm. Each time Windows 95 starts, it looks in the folder Sysbckup, found in the main Windows 95 folder. It compares each file found in this folder with the active copy of that same file, and "repairs" any that are different. Most of the time this is excellent protective behavior; it just happens that different versions of WINSOCK.DLL can be *very* different. In most cases, the solution is to move the Internet access program's copy of WINSOCK.DLL from the Windows 95 system directory into the program's own directory. If this doesn't work, chances are your problem is more complicated. If that's the case, get in touch with your Internet access program's technical-support staff.—*Neil J. Rubenking*

New Folder Icons In OS/2

I like OS/2 Warp a lot but find the icons for subdirectories in the Drives folder unattractive. I have a collection of great 256-color folder icons I'd love to use, but I can't figure out how. I suppose I could go through every folder and change the icon manually (very tedious), but what I'd really like is that whenever I create a new directory (through DOS, Windows, or OS/2), an icon of my choice is used as the default icon. Do you have any suggestions?

ROBERT SHAND,
Cape Town, South Africa

PC MAGAZINE: I don't know of any way to change the default icon for folders, but I can suggest a way to create new directories that will always use your own icon for those folders. Open the Templates folder and right-click on the template labeled "Folder." From the pop-up menu, select Copy. Warp displays a dialog allowing you to name your new template; pick something like MyFolder to distinguish it. The new MyFolder icon will appear in the Templates folder. Right-click on that icon and select Settings from the pop-up menu. Click on the General tab of the settings notebook to see the icon assigned to items created from this template. Now, drag your favorite icon into the "current icon" area of the settings notebook and it will replace the drab icon that comes with Warp. The icon for MyFolder in the Templates folder won't change, but don't worry.

When you want to create a new directory, open the Drives object and select the parent directory within which you want to create the new subdirectory. From the Templates folder, drag the MyFolder icon and drop it into the parent directory in the Drives window. You have created a new subdirectory named MyFolder. Now move the pointer to the new directory and press the left mouse button while holding down the Alt key. The text "MyFolder" becomes an input field, letting you change the text to the name you want to give your new subdirectory. Change the name and click anywhere within the Drives window to tell Warp you're done.
—*Brian Proffit*

WORD PROCESSING

Multilevel Sorts In Word

When I've created tables in either Word 6.0 or 7.0, the buttons Sort Ascending and Sort Descending on the Database Toolbar have proven to be quite useful. They're intelligent enough to sort an entire table, minus the header row, even if you've highlighted only part of the table. To sort by any column, simply place the cursor in that column and click the button. Unfortunately, these buttons are limited to sorting only one column at a time. But I figured out a way to do multilevel sorts in Word tables with the toolbar buttons.

To perform a multilevel sort, start with the least-significant column, and work your way to the most significant. Suppose, for example, you have a list of names and addresses that you need sorted primarily by state, then by last name within state, and then by first name within last name. Start by placing the cursor in the first-name column and clicking on the sort button of your choice. Then place the cursor in the last-name column and click on the button again. Finally, place the cursor in the state column and click on the button a third time.

With each new sort, Word retains the prior sort order, except where it needs to change it to meet the new sort order. So the first names remain sorted within the list of identical last names, and the last names remain sorted within the list of states.

SHANE DEVENSHIRE,
Walnut Creek, California

PC MAGAZINE: This technique will indeed give you multilevel sorts, but sorting the entire table and leaving the first row out of the sort aren't always desirable. You may, for example, want to sort only a section of a table, and you may have data rather than a header in the first row. In either situation, the toolbar buttons won't give you the result you want. Still another limitation is that the toolbar buttons will work only in tables or on an entire file. If you format tabular data using tabs instead of the table feature and try to sort it, the toolbar Sort buttons will insist on sorting your entire file, even if you select the table before clicking on the button.

For any sort that doesn't match the Sort buttons' preconditions, you'll want to use the Table | Sort command from the menu bar, which will sort text whether it's in a table or not. If you select some text or part of a table before choosing Table | Sort, Word will limit the sort to your selection. If you don't select anything, Word will automatically select the entire table if the cursor is in a table, or the entire document if the cursor isn't in a table.

The Sort Text dialog box offers much more powerful options than the toolbar buttons and can do its work quicker. It lets you select three levels to sort by, so you could sort by state, then by last name, and then by first name, as in the example above, with a single Sort command.

You can also indicate whether or not your table has a header row; if it does, Word presents your column names as your sort options instead of the uninformative "Column 1," "Column 2," and so on. You can also specify the type of information you're sorting, whether it's text, a number, or a date. Clicking on the Options button produces the Sort Options dialog box, in which you can select where fields should be separated (if it's nontabular data), whether the sort should be case-sensitive, and whether you'd like to sort only the column and not its matching row data.

The Sort command here can set ascending or descending sorts for each level you choose. If you need to go beyond three levels of sorting, however, you can use the same approach with the Table | Sort command as with the toolbar Sort buttons tip above. Here again, start by sorting the least-significant columns first and working your way to the most-significant columns. Note that this technique may be worth trying in other programs that let you sort; in many cases, it will give you a way to sort on more keys than the program's Sort feature allows.—*M. David Stone*

SPREADSHEETS

Using Excel's OnEntry Property to Enforce Negative Debit Entries

I'm an accountant, and I needed an Excel sheet with a row of debit entries. I wanted the entries to appear negative whether the user typed in a negative or positive number. It's difficult to do this with formulas, because the user must type in a cell other than the one in which the value appears.

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Pentium 120	11.3" Active SVGA	16MB/1GB	4199 †
Pentium 120	11.3" Active SVGA	16MB/1GB	4199
Pentium 120	11.3" Active SVGA	16MB/1GB	4349 *
Pentium 133	12.1" Active SVGA	16MB/1GB	4999 †
Pentium 133	12.1" Active SVGA	16MB/1GB	4999
Pentium 133	12.1" Active SVGA	16MB/1GB	5149 *

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Pentium 100	10.4" Active SVGA	8/810MB	2699 †
Pentium 100	10.4" Active SVGA	8/810MB	2699
Pentium 100	10.4" Active SVGA	8/810MB	2849 *
Pentium 120	11.3" Active SVGA	8MB/1.2GB	3599 †
Pentium 120	11.3" Active SVGA	8MB/1.2GB	3599
Pentium 120	11.3" Active SVGA	8MB/1.2GB	3749 *
Pentium 133	11.3" Active SVGA	16MB/1.2GB	4299 †
Pentium 133	11.3" Active SVGA	16MB/1.2GB	4299
Pentium 133	11.3" Active SVGA	16MB/1.2GB	4449 *

* Features 28.8 fax/modem
† Features Windows for Workgroups OR Windows 95

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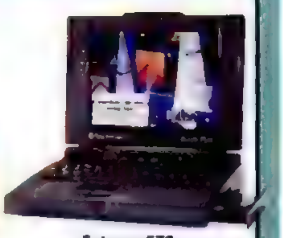
Pentium 100	11.3" Dual Scan	8/810MB	2749*
Pentium 100	10.4" Active	8MB/1.2GB	3429*

* Features 6X CD-ROM drive



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Pentium 133	12.1" Active SVGA	16MB/1.3GB	5799
Pentium 133	12.1" Active SVGA	16MB/1.4GB	6499

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Pentium 100	10.4" Active	8/810MB	2199
Pentium 100	11.3" Dual Scan SVGA	8/810MB	2479 *
Pentium 100	11.3" Dual Scan SVGA	8/810MB	2899 *†
Pentium 120	11.3" Dual Scan SVGA	16MB/1.1GB	2999 *
Pentium 120	11.8" Active SVGA	16/810MB	3699 *
Pentium 133	11.8" Active SVGA	16MB/1.1GB	4399 *

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Pentium 75	11.3" Dual Scan	8/810MB	3210
Pentium 75	10.4" Active	8/810MB	3399
Pentium 120	10.4" Active	8MB/1.35GB	4720
Pentium 100	11.3" Dual Scan SVGA	8/810MB	3059
Pentium 120	11.3" Active SVGA	16MB/1.35GB	5099
Pentium 120	10.4" Active SVGA	16/810MB	3999
Pentium 133	12.1" Active SVGA	16MB/1.35GB	5669
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Pentium 100	11.3" Dual Scan SVGA	8/810MB	2799 *
Pentium 100	11.3" Active SVGA	8/810MB	2899
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Pentium 100	10.4" Active SVGA	8/720MB	3499 *
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Pentium 120	11.8" Active SVGA	16MB/1GB	4999 *
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Pentium 120	12.1" Active SVGA	16MB/1.35GB	5379
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Pentium 100	11.3" Dual Scan SVGA	8MB/1.2GB	3779
Pentium 133	11.3" Active SVGA	8/800MB	4249
Pentium 133	11.3" Active SVGA	8MB/1.2GB	4729

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Pentium 75	10.4" Dual Scan SVGA	8/800MB	2159
Pentium 100	10.4" Dual Scan SVGA	8/800MB	2349
Pentium 100	10.4" Active Matrix SVGA	8/800MB	2839
Pentium 133	10.4" Active Matrix SVGA	8/800MB	3299

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Pentium 100	11.3" Dual Scan SVGA	8/810MB	2099 *
Pentium 120	11.3" Dual Scan SVGA	8MB/1GB	2449
Pentium 120	11.3" Dual Scan SVGA	8MB/1GB	2449 *
Pentium 120	11.3" Active SVGA	8MB/1GB	2939
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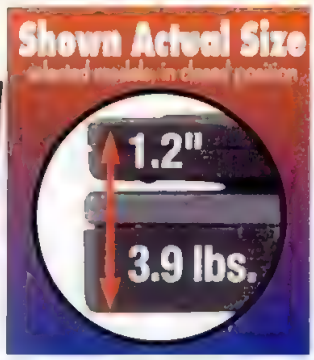
Pentium 133	11.3" Active SVGA	16MB/1.35GB	4499 *
Pentium 133	11.3" Active SVGA	16MB/1.35GB	4699 †
Pentium 150	11.3" Active SVGA	16MB/1.35GB	4799
Pentium 150	11.3" Active SVGA	16MB/1.35GB	4799 *
Pentium 150	11.3" Active SVGA	16MB/1.35GB	4999 †

* Features Windows for Workgroups
† Features Windows NT



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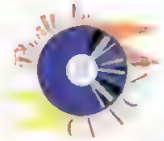
Pentium 100	11.3" Dual Scan SVGA	16MB/1GB	2699*
Pentium 100	11.3" Dual Scan SVGA	8MB/1GB	2999*††
Pentium 120	11.3" Active SVGA	8MB/1GB	3869*†
Pentium 120	11.3" Active SVGA	8MB/1GB	3999*††
Pentium 133	12.1" Active SVGA	16MB/1GB	5699*†



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Pentium 133	8MB/1.2GB	6X	1750
Pentium 133	16MB/1.6GB	6X	2050
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- AST Works II navigation software – featuring "SPOT"
- Enhanced IDE interface-fast disk performance
- AST Lifeline technical support

Processor	RAM/HD	CD-ROM	Price
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Pentium 133	8MB/1.2GB	6X	1729
Pentium 133	16MB/1.2GB	6X	1699
Pentium 133	16MB/1.6GB	6X	1819
Pentium 150	16MB/1.6GB	6X	1859
Pentium 150	16MB/2.1GB	6X†	2119
Pentium 166	16MB/2.1GB	6X†	2259

† with 3 disc CD changer

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Monitors priced separately

AST Advantage Adventure

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- 1280 x 1024 video resolution

UP TO 166MHz

Processor	RAM/HD	CD-ROM	Price
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Pentium 166	16MB/2.5GB	6X	2369

Monitors priced separately

Presario Multimedia

Monitors priced separately

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IBM Aptiva

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- 28.8 data/fax/voice modem with telephony
- MPEG support with full motion video
- 16-bit WaveTable 3-D Surround Sound
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Processor	RAM/HD	CD-ROM	Price
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Pentium 133	16MB/1.6GB	8X	1999
Pentium 166	16MB/2.0GB	8X	2449
Pentium 200	16MB/2.5GB	8X	2899
Pentium 200	32MB/3.2GB	8X	3299

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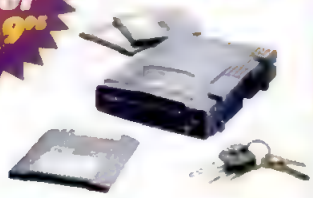

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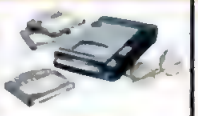

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Creative Labs SoundBlaster 32 PnP
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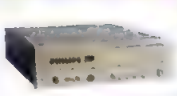
$175.00



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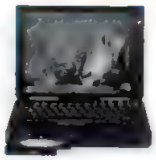

PC MAGAZINE EDITORS' CHOICE Jan. 23, 1996

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- 800MB Hard Drive
- 10.4" TFT active-matrix
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USR Sportster ISDN 128K Modem	$250	Diamond Stealth 64 Video 2201XL	$189	Canon BJC70 287	$287	AST Ascentia P50 P/133	$4 205
Iomega Zip Drive	$189	Hewlett Packard Deskjet 1600CM	$1 899	Citizen PN50 Portable Printer	$199	Adaptec SlimSCSI APA1460	$159
Syquest EZ135 Drive	$116	Umax PageOffice	$194	Motorola's Marquis Ethernet 28.8	CALL		
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Bravo MS-T P/100 16/1.2GB	1,705
Bravo MS-T P/133 16/1.2GB	1,815
Bravo MS-T P/166 16/1.2GB	2,144
Bravo MS-T P/166 16/2.0GB 6XCD	2,363

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Proliant **In Stock**	CALL
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NEC

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PowerMate P/150 16/1.6G	1,941
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PowerMate P/166 16/1.6GB CD	2,429

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Jumbo 1400 Int	183
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PowerTape 4000 4GB Int Ext	1,036 1,212

IOMEGA

Iomega Ditto Easy 800 Int Ext	$ 111 / 141
Iomega Ditto Easy 3200 Int Ext	229 289

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ATI

Graphics Xpression 2MB ISA / PCI	$ 116 / 125
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Graphics Pro Turbo 2MB ISA / PCI	250 / 250
Graphics Pro Turbo 4MB ISA / VLB	400 / 354
Graphics Pro Turbo 4MB PCI	389

matrox

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Matrox Millennium ModVideo Capture Board	284

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Imagine 128 1600 4MB PCI	841
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9FXMotion 771 4MB PCI / VLB	444 / 444

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Edge 3D 3240XL 2MB PCI	358
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DX15T 15"	418
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ViewSonic 17" EA	632
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1.0GB F-ATA	192
2.1GB F-ATA	315

Maxtor

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AC31600 1.6GB	237
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Optra Lx+ 16ppm 1200dpi	1,818
Optra Lx+ 16ppm 1600dpi	2,857
4039 10 Plus 10ppm 600dpi	1,045
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1200PS	1,336
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OL610e . OL610e PS	484 / 692
OL810e / OL810e PS	754 / 1,078
Pacemark 3410	1,381

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MicroLaser WIN 4	423
MicroLaser PowerPro/12	1,379

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6Xe Ext	329
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3C509B-Combo 5pk 20pk	113	496	1828
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FMS II TP Hub 12 Port 24 Port	$ 299 837
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intel

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3.5" v3.12 100 250 user	3,551	5,057

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EtherEZ10BT combo	102
EtherPower 10/100BT PCI 5pk	138 647
EtherPower 10BT PCI 5pk	115 517
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PC600ws coax	120
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TokenCard Elite 16/4	510
TigerHub TP6 port + AUI	163
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TARGUS

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J30 P/100 8/800MB Dual 10.4"	2,322
J50 P/133 8/800MB TFT 10.4"	3,270
P30 P/100 8/800MB Dual 11.3"	3,271
P30 P/100 8/1.2GB Dual 11.3"	3,738
P50 P/133 8/800MB TFT 11.3"	4,205
P50 P/133 8/1.2GB TFT 11.3"	4,673

COMPAQ

Armada 4130T P/133 16/1.08MB 11.8 TFT	$ 4,285
Armada 1120 P/100 8/810MB 10.4 STN	1,832
Armada 1120T P/100 8/810MB 10.4 TFT	2,143
Armada 4110D P/100 8/810MB CD 11.3 STN	2,735
Armada 4120 P/120 16/1.08GB 11.3 STN	2,982
Armada 4120T P/120 16/1.08GB 11.8 TFT	3,634
LTE 5280 P/120 16/1.35GB 11.3" TFT	5,099
LTE 5300 P/133 16/1.35GB 12.1" TFT NEW	5,699

IBM

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365E 5X86C 100 8/540MB 10.4" Dual NEW	1,705
365ED 5X86100 8/540MB 10.4" Dual 4x NEW	2,399
365XD P/100 8/810MB 10.4" Dual 4x NEW	2,659
365X P/100 8/810MB 10.4" Dual NEW	2,399
365X P/100 8/810MB 10.4" TFT NEW	2,749
365XD P/120 8/1.08GB 10.4" TFT 4x NEW	3,558
365XD P/120 8/1.08GB 11.3" Dual 4x NEW	3,179
560 P/120 8/810MB 11.3" Dual NEW	2,599
560 P/120 8/810MB 12.4" TFT NEW	3,599
560 P/133 8/1.08GB 12.4 TFT NEW	3,999
560 P/100 8/810MB 11.3" Dual NEW	2,525
560 P/120 8/810MB 12.1" TFT NEW	3,549
560 P/133 8/1.08GB 12.1" TFT NEW	3,999
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760EL P/133 16/1GB 12.1" TFT NEW	5,193
760ELD P/100 8/810MB 12.1" TFT 4x NEW	4,299
760EL P/120 8/1.08GB 12.1" TFT	4,544
760L P/90 8/810MB 10.4" TFT	3,999
760L P/90 8/1.20MB 12.1" TFT	5,099
760L P/120 8/1.20MB 12.1" TFT	5,389
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VBA code using the OnEntry property. In the Auto_Open procedure, I set OnEntry to point to another procedure named Make_Negative. Whenever the user enters a value in a cell on that sheet, Make_Negative runs. I test whether the current cell is in the same row as the range of cells I want negative, and if it is, I set the value in that cell to the negative of its absolute value. The result is that the number becomes negative whether the user enters a positive or negative one.

The code looks like this:

```
Sub Auto_Open()
Worksheets("Sheet1").OnEntry = _
  "Make_Negative"
End Sub

Sub Make_Negative()
  If ActiveWindow.ActiveCell.Row = _
  Worksheets("Sheet1").Range _
  ("DebitRow").Row Then
    ActiveWindow.ActiveCell.Value = _
   -Abs(ActiveWindow.ActiveCell.Value)
  End If
End Sub
```

One thing I had a hard time with is the test in my If statement. I would have preferred to test whether the active cell was somewhere in the named range I had specified, but I could not figure out how to test that explicitly.

DANNA SELTZER,
Maplewood, New Jersey

PC MAGAZINE: Actually, when the named range is an entire row (as I presume it is in your case), it's a lot simpler just to check and see whether the current cell's row is the same as the named range's row—exactly as you have done. I would suggest a couple of changes to Make_Negative, however.

You can use `With .. End With` to reduce the number of dots that VBA will have to parse when executing the code. The construction

```
With ActiveWindow.ActiveCell
If .Row = Worksheets("Sheet1").Range _
("DebitRow").Row
 Then
    .Value = -Abs(.Value)
  End If
End With
```

is equivalent to the body of your Make_Negative, but it runs slightly quicker, and it's easier to read.

And, because the ActiveCell property belongs to ActiveWindow unless you specify otherwise, you can safely drop ActiveWindow. Assuming your workbook has only one range named DebitRow, you can also omit the Sheet1 qualifier, leaving you with

```
With ActiveCell
  If .Row = Range("DebitRow").Row Then
    .Value = -Abs(.Value)
  End If
End With
```

As the code stands, if the user accidentally enters text in a DebitRow cell instead of a number, VBA presents an ugly type-mismatch error—which may be doubly disconcerting, since the user may not even know he or she is running a macro. The simplest way to deal with that possibility is simply to add

```
On Error Resume Next
```

at the beginning of Make_Negative.

If the user enters a formula instead of a constant in a DebitRow cell, the `.Value = -Abs(.Value)` statement converts that formula to a constant. I presume that's okay with you, but it's something you should be aware of.

Finally, one caveat about using OnEntry: Cell changes made by way of Edit menu commands do not trigger the OnEntry routine. Thus, if the user puts 100 in a DebitRow cell by pasting in that value from some other cell, the DebitRow cell will keep the positive value. If you're concerned about that, you might consider adding the following:

```
Sub Auto_Close()
  For Each Item in Range("DebitRow")
    Item.Value = -Abs(Item.Value)
  Next Item
End Sub
```

This Auto_Close routine makes a quick pass through DebitRow, converting any positives to negatives.—*Craig Stinson*

DATABASES

Reading and Writing Windows 95's Registry

Can you tell me how to read from and write to the Windows 95 registry from my 32-bit Microsoft Access 95 or Visual Basic programs?

CHRISTOPHER TRUEBLOOD,
New York, New York

PC MAGAZINE: You could write custom VBA code to call the registry functions in the Win32 API, but probably the easiest way is to get the Wright Registry Control, a shareware ActiveX control that provides easy access to the registry. The control provides a typical VBA/OCX interface layer through which you access the registry by setting properties and invoking methods. To demonstrate how it works, suppose you want to store a "last visit" date and time for your custom application, and you decide to store the values in the registry. You'd then like to display these values in a "welcome" window whenever your application starts. Figure 1 shows how you could accomplish this using the Wright Registry control and some custom code placed in the appropriate events on a form. Figure 2 shows the welcome window that results.

You start by placing the Wright Registry control on a form and giving it a reasonable name, like MyRegControl (select the Insert menu, choose Custom Control, then choose Wright Registry Control. Set the control's name property to "MyRegControl"). Note that even though the control is visible in design mode, it's not visible when you run the form.

To access the registry programmatically at runtime, you first set the Wright Registry control's Hkey and Subkey properties. The Hkey property stores the root key that you want to examine. It can be any one of the following constants (which correspond to standard registry root keys): regHkeyClassesRoot, regHkeyCurrentUser, regHkeyLocalMachine, or regHkeyUsers. Next, you set the Subkey property to the name of the subkey you want to examine or modify. Based on your Hkey and Subkey settings, the Wright Registry Control examines the registry and populates two collections, Keys and Values, with all of the keys and values for your subkey. You can then use the Keys collection to examine or delete keys or to add new ones. Similarly, you can use the Values collection to examine, add, or delete named values. The Keys collection contains Key objects, while the Values collection contains Value objects.

> The Wright Registry Control provides a typical VBA/OCX interface layer through which you access the registry.

So the basic logic is simple: Set your hkey and subkey, then work with the Keys and Values collections. Armed with this knowledge, you should be able to understand the code in Figure 1. The code must do three things: display the last date and time stored in the registry when the form opens, close the form when you press the Close button, and update the date and time in the registry with the current date and time when the form closes. So you'll need to place code in three events—the form's On Load event, the form's On Close event, and the On Click event of the button used to close the form.

In the Form Load event procedure, you want to set the ctlLastVisit control on your

The Vision

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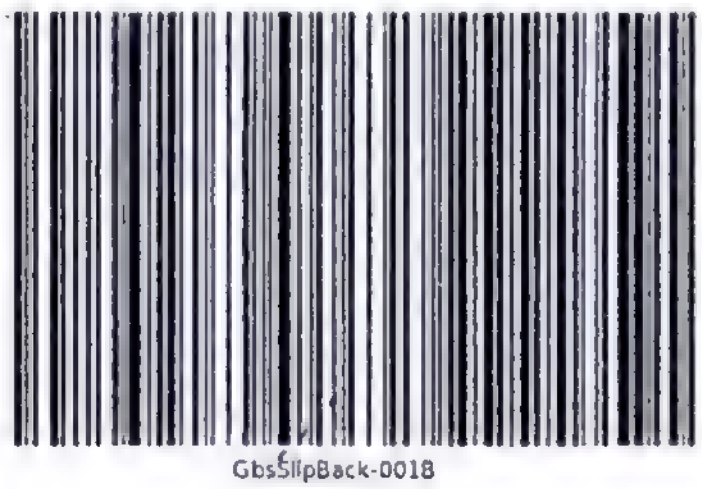

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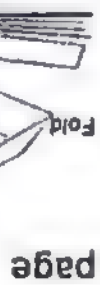

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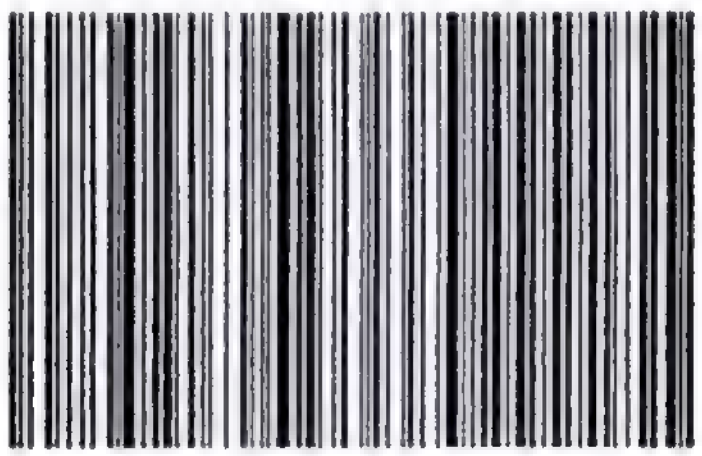

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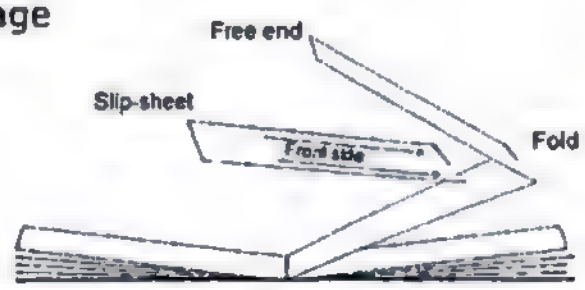

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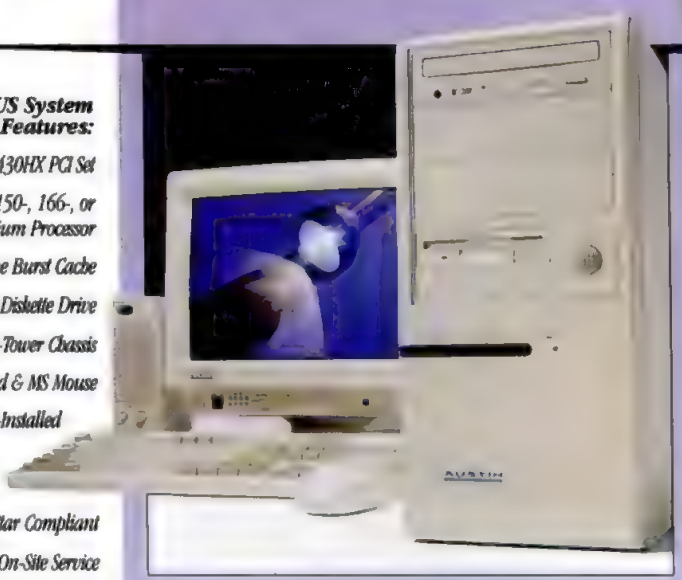

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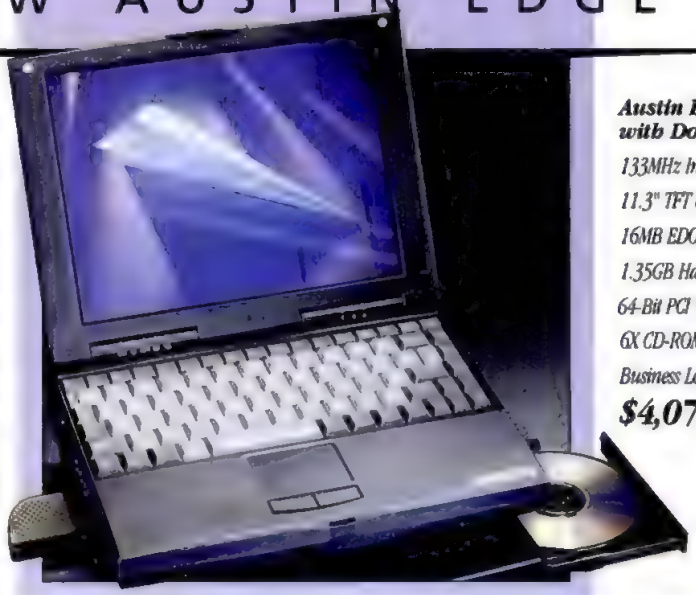

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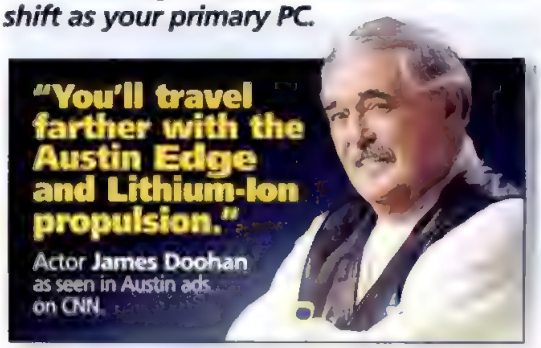

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1Meg/4 Zip Pkg	-	24.00	22.00	21.00	-
256x4 Page Dip	-	7.25	5.75	6.00	6.95
256 4-Static Dip	-	-	9.00	-	-
256x4 Page Zip	-	9.25	9.00	8.95	-
256x4 Video Zip	-	-	10.00	9.00	7.95
256x8/SOJ	-	19.00	16.00	-	-
256 x1	-	3.25	2.85	2.75	2.25
64x4	-	-	-	-	-
64x1	-	-	-	-	2.00
256x16 SOJ	-	39.00	29.00	-	-
256x16 SOJ Edo	-	39.00	-	-	-
256x16 Video Zip	-	49.00	39.00	-	-

CACHE MODULES

256K (168 pin) Pipeline Burst Cache Module $22.00

512K (168 pin) Pipeline Burst Cache Module $39.00

256K (168 pin) Async Cache Module compatible with IBM Aptiva $69.00

INTEL Math Chips

80287-XL	40.00
80387 16 DX	39.00
80387 20 DX	44.00
80387-DX (Does All)	49.00
80487-SX (Does All)	183.00
Intel SX (Does All)	49.00
Intel SL Model	99.00
Intel 165X	29.00
Intel 200X	29.00

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CYRIX Fasmath

Cyrix 330X $39 Cyrix 400X $79

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CX486 DRx² 25/50 199.00 CX486 DRx² 33/66 199.00 CX486 SRx² 25/50 189.00

SIMM MODULES (Add $5.00 for SIPP)

	4MB	8MB	16MB	32MB
256 x 9	-	-	6.00	5.00
1Meg x 9 (3 chip)	12.00	11.00	10.00	-
1Meg x 9 (9 chip)	22.00	20.00	19.00	17.00
4Meg x 9	46.00	44.00	-	-
1Meg x 9 (9 chip)	185.00	185.00	-	-

72 PIN SIMMS (FPM, EDO)

	8MB	16MB	32MB
256 x 36 1 mg	27.00	13.00	13.00
512 x 36 2 mg	46.00	44.00	44.00
1 meg x 36 4 mg	92.00	89.00	89.00
1 x 32 8 mg	89.00	89.00	89.00
1 x 32 16 mg	179.00	179.00	179.00
2 x 32 16 mg	359.00	359.00	359.00
2 x 32 32 mg	719.00	719.00	719.00
4 x 32 16 mg	719.00	719.00	719.00
4 x 32 32 mg	1439.00	1439.00	1439.00
8 x 32 32 mg	2879.00	2879.00	2879.00
16 x 32 64 mg	5759.00	5759.00	5759.00
1 x 32 4 mg	44.00	44.00	44.00
1 x 32 8 mg	89.00	89.00	89.00
2 x 32 8 mg	179.00	179.00	179.00
2 x 32 16 mg	359.00	359.00	359.00
4 x 32 8 mg	359.00	359.00	359.00
4 x 32 16 mg	719.00	719.00	719.00
8 x 32 32 mg	1439.00	1439.00	1439.00

DIMMS (168 pin)

512x64	4Meg	59.00
1 x 64	8Meg	79.00
2 x 64	16Meg	159.00
4 x 64	32Meg	279.00
8 x 64	64Meg	509.00
16x64	128Meg	Call
2.5V SDRAM	8Meg	129.00
2.5V SDRAM	16Meg	249.00
2.5V SDRAM	32Meg	499.00
5V EDO	8Meg	109.00
5V EDO	16Meg	209.00
5V EDO	32Meg	399.00
5V EDO	64Meg	799.00

ECC Simms/Dimms Modules

Pentium Pro 72 Pin (install in pairs) SIMMS

16Meg	209.00
32Meg	419.00
64Meg	2199.00
128Meg	4331.00

5V 168 Pin (install in pairs) / DIMMS

16Meg	239.00
32Meg	479.00
64Meg	899.00

3.3V 168 Pin (install in pairs) / DIMMS

16Meg	269.00
32Meg	539.00
64Meg	1079.00
128Meg	Call

SO DIMMS (72/144 pin)

72 Pin 3.3V	4Meg	74.00
72 Pin 3.3V	16Meg	149.00
72 Pin 3.3V	32Meg	299.00
72 Pin 5V	4Meg	72.00
72 Pin 5V	16Meg	119.00
72 Pin 5V	32Meg	239.00
72 Pin 5V	32 64Meg	479.00
144 Pin 3.3V	8Meg	139.00
144 Pin 3.3V	16Meg	279.00
144 Pin 3.3V EDO	16Meg	179.00
144 Pin 3.3V EDO	32Meg	349.00
144 Pin 5V EDO	8Meg	159.00
144 Pin 5V EDO	16Meg	299.00
144 Pin 5V EDO	32 Meg	599.00
144 Pin 5V EDO	64Meg	2099.00

AST MEMORY

MODEL	AMT. UPGRADED	AST PART #	PRICE
Bravo LC Series, Bravo MT, Bravo MS	4Meg	500387-003	79.00
486 L Advantage Pro (ECS) 5/25	8Meg	500387-004	79.00
	16Meg	500387-004	129.00
	32Meg	500387-004	279.00
Premmia LX P/60, 90/4/66d, 4/100T P/60	8Meg	500388-003	79.00
	16 Meg	501340-002	129.00
	32 Meg	501340-002	279.00
	64 Meg	501569-001	649.00
Premmia 4133, 4133S, 4/50d, 4/66d	8 Meg	501159-002	89.00
Premmia SE 4/33, 4/66d P/60	16 Meg	501159-003	149.00
Premmia MTE 4/33, 4/66d P/60	32 Meg	501159-004	329.00
Manhattan G V Series Server	64 Meg	501159-005	659.00
Power Premmia 3/33, 4/33, 4/33S, 4/50d, 4/66d	8Meg	500780-001	169.00
Premium 486/25, 486/25E, 486/33, 486/33E			
Premium 386/33TE 486/25TE, 486/33TE			
Prem. II 386/25, 386/33, 486/33, 486 SX/20	2 Meg Kit	500788-005	69.00
Bravo 486/25, 486/33			
Advantage 486/25, 486/33, 486/33P, 486 SX/20	8Meg Kit	500780-001	169.00
Premium SX 4/25	1 Meg	500780-003	19.00
Premium SE 4/50, c 66d, P/60	4Meg	500780-004	79.00
Prem. 386/33T, 386 SX/16, Prem. II 386SX 20, 386/25	8Meg Kit/16MegKit	501565-001/501566-001	69/179
Premmia GX P/60, P/100	32Meg Kit/64MegKit	501567-001/501568-001	319/699
AST Cupid Board	0-12 Meg	500818-001	159.00

AMBRA

Ambra Av. 425SL	2-4 Meg	69 /Dx199
Ambra M 425DX2	4/8/12/16 Meg	89/199/229
Ambra SA Series	4/16 Meg	79/219
Ambra M-75 /M-100	4/8/16	99/129/219

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6259935 (2Meg)		69.00
6259694 (4Meg)		89.00
92G7720 (4Meg)		99.00
4Meg, 8Meg, 16Meg, 32Meg	PC 300 Series	39/69/134/299
4Meg, 8Meg, 16Meg, 32Meg	PC 700 Series	39/69/134/299
4Meg, 8Meg, 16Meg, 32Meg	PC Power Series	39/69/134/299
4Meg, 8Meg, 16Meg, 32Meg	PC Server 300 325 520	39/69/134/299
4Meg, 16Meg, 32Meg, 64Meg	PC Server 500	179/239/479
92G7334 (16Meg 168 pin Edo)	IBM 730 750	199.00
92G7335 (32Meg 168 pin Edo)	IBM 730 750	399.00
92G7539 (1Meg)	[illegible]	39.00
92G7541 (8Meg)	[illegible]	99.00
92G7543 (16Meg)	[illegible]	124.00
92G7545 (32Meg)	[illegible]	299.00
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73G3132 92G7203 (8Meg)	[illegible]	99.00
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6450129 92G7202 (4Meg)	[illegible]	49.00
6450129 92G7428 (8Meg)	[illegible]	99.00
6450130 92G7202 (8Meg)	[illegible]	99.00
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6FS1416 67G1421 (8Meg)	Thinkpad 750, C 760, C 720, C CL575X	149.00
6450005 (1Meg, 32Meg)	Thinkpad 730, C	219/499
6450004 (4Meg)	Thinkpad 755 360 355 340 450	49.00
6450004 (8Meg)	Thinkpad 755 360 355 340 450	139.00
6450002 (16Meg, 32Meg)	Thinkpad 755, 360, 355, 340, 450	229/499
6450003 (16Meg, 32Meg)	Thinkpad 750C, 755C, 360C, 340C, 560	119/249/279
6189098 (4Meg)	Thinkpad 500 510CS (3.3 volt)	89.00
[illegible]	Thinkpad 500 510CS (3.3 volt)	139/339
79F0899 (2Meg)	LX40 N33SX PS Note	69.00
79F1000 (4Meg)	LX40 N33SX PS Note, Flpd 360 350c PS Note 425	99.00
79F1001 (8Meg)	LX40 N33SX PS Note	159.00
Hard Drive (810 Meg, 1.3 Gig)	Thinkpad 750, 755, 360, 355	479/819
(4Meg/16 Meg w/Rdio)	Thinkpad 755 Drives Modules	359/719
(4Meg/16 Meg w/Rdio)	Thinkpad 755	174/389
6000378 (8Meg)	Thinkpad 350, 360c, PS Note 425	119.00
6000379 (16Meg)	Thinkpad 350, 360c, PS Note 425	199.00
6189099 (16Meg)	Thinkpad 350	119/219/429
92G7259 (4Meg)	Thinkpad 701C CS Butterfly	89.00
92G7261 (8Meg)	Thinkpad 701C CS Butterfly	179.00
92G7263 (16Meg, 32Meg)	Thinkpad 701C CS Butterfly	199/536
84Gg *(4Meg)	Thinkpad 820	219/399
84Gg *(8Meg)*16Meg/32Meg	Thinkpad 850	99/189/299/499
84Gg *(4Meg/32Meg)	Thinkpad 700	129/799/Call
Hard Drive (810Meg)	Thinkpad 700	479.00

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Deskpro 4/50 486 4/66 575 590, 5125, 5133	4/8/16/32Meg	49/99/179/339
Deskpro 4/50	2/4 Meg	49/99/179
Deskpro 4/50	4/8/16/32 64Meg	99/189/359/799
Deskpro 4/50	4/8/16/32/64Meg	99/189/359/799
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Prolinea MT 4/33S, 4/50, 4/66 Enhanced 4/33S, 4/50S, 4/60, 4/66	4/8/16/32 Meg	99/189/359/799
Prolinea 450 466 4100 575 590, 5120, 575 590, 5120	4/8/16/32Meg	99/189/359/799
575 mini, 5100 mini 5133 mini		
Prolinet 7500 575, 5100 1500M 575, 5100 (install in pairs)	4/8/16/32Meg	99/189/359/799
Prosignia 300, 575 590, 500 5/90 500 5/120 (install in pairs)	4/8/16/32Meg	99/189/359/799
Prolinet 1000 560 Prosignia 590 (install in pairs)	4/8/16/32	99/189/359/799
Prolinet 2000 486/50 5/66 5/90 2000R 5/66, 5/90 (install in pairs)	4/8/16/32	99/189/359/799
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Elite 5000, 5200	2Meg/4Meg/32Meg/64Meg			219/319/762/1529
LTE 386S/20	4Meg	Module	121125-002	99.00
LTE LITE/20 25 25C	4Meg	Module	129789-002	99.00
LTE LITE/20 25 25C	8Meg	Module	129789-003	149.00
LTE LITE/20 25 25C	16Meg	Module	129789-004	279.00
LTE LITE 425C/33C/25E/25L	4Meg	Module	142337-002	99.00
LTE LITE 425C/33C/25E/25L	8Meg	Module	142337-003	189.00
LTE LITE 425C/33C/25E/25L	16Meg	Module	142337-004	279.00
SLT/386	4Meg	Module	118305-301	99.00
Concerto, LTE Elite	4Meg		144780-001	79.00
	8Meg		144780-002	119.00
	16Meg		144780-003	219.00
Contura 320, 325	4Meg		136488-001	99.00
	8Meg		136489-001	179.00
	16Meg		136490-001	279/319
Contura 400, 410, 420, 430	4Meg/8Meg/16Meg			
Contura 4/25, 4/25C, 4/25Ci	4Meg		146520-001	79.00
	8Meg		146521-001	119.00
	16Meg		146531-001	219.00
Aero 4/25, 4/33	4Meg		140532-001	89.00
	8Meg		140597-001	169.00

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	QUANTUM			MAXTOR		WESTERN DIGITAL	
850MB	CFS 850A	$460	1.0 GIG	7850 AV	$570	850MB AC2850	$199
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S-RAM Cards 2MEG	199	Portable CD ROM (4x & 6x)	Call
28.8/14.4 Data/Fax Modem	189	SCSI Type II	139
14,400/14,400 Data/Fax Modem	94	Audio Card	49
Reachnet Card (LISA Slot)	149	Multimedia Combo, Sound/SCSI	499
Lan Ethernet (Coax) (10 Base T)	89	Type III 340 Meg Hard Drive	479
		Lucom Combo Ethernet + Modem II 28.8 Adapter	549

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Tecra 700 710, 720 (8/96MB)	8Meg/16Meg/32Meg		149/299/599
Tecra 700, 710, 720 (16MB)	16Meg/32Meg		229/599
T2000SX/E 2200SX,T1800, 1850, C	2Meg/4Meg/8Meg	PC-PA2000U	69/99/179
T2100 2105 2150, 2155, 2110, 2115	4Meg/8Meg/16Meg/24 Meg		79/119/219/349
T4500 C 19500 T1900 T1950 (3.3 v)	4Meg	PC-PA2012U	69.00
T4500 C 14605 T4700 T1900 C T1910 T1950 (3.3 v)	8Meg	PC-PA2013U	109.00
T4500 C 14600 T4700 T1900 C T1910, T1950 (3.3 v)	16Meg	PC-PA2014U	199.00
T4700 4800 4850 (Hard Drive)	810Meg/1.3 Gig		729/939
T3400CT, T3600 T3900	4Meg/8Meg/16Meg	PC-PA2019U	99/139/279
T8000 610 CT Edo	8Meg/16Meg/32Meg		119/199/359
T4800C3 486CDT T1400, 1600 Edo	8Meg/16Meg/32Meg		119/199/359

NOTEBOOK, LAPTOP MEMORY

MODEL	AMT UPGRADED	MANU PART #	PRICE
ACER 700, 730C, 300, 730	4Meg/8Meg/16Meg		49/79/159
ACER 725, 780, 780, 784, 786, 787	4Meg/8Meg/16Meg		69/99/179
ACER 920	4Meg/8Meg/16Meg		69/99/179
ACER Note Pro, ACER Note Lite	4Meg/8Meg/16Meg		69/99/179
AST 4/33	4Meg/8Meg/16Meg		69/99/179
AST Ascentia 210	4Meg/8Meg/16Meg/24Meg/32Meg		119/219/419/Call
AST Ascentia 800N, 800S, 810, 910	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
AST Assembly 950	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
AST Bravo LC Series	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
AST Notebook Power Exec 386SX/20/25/25L	4Meg/8Meg/16Meg/24Meg/32Meg	501166-001-002	79/119/219/419/Call
AST Power Exec 4/33C, 4/25EC, 4/25EC	4Meg/8Meg/16Meg/24Meg/32Meg	501166-001-002	79/119/219/419/Call
AST Power Exec 4/33C	4Meg/8Meg/16Meg/24Meg/32Meg	501166-001-002	79/119/219/419/Call
AT&T Globalyst 130 200 (Call for other Globalyst)	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
AT&T Safari NSX/20	4Meg/8Meg/16Meg/24Meg/32Meg	PEC 37851	79/119/219/419/Call
Austin TX4 DX2 SX2 SX Series	4Meg/8Meg/16Meg/24Meg/32Meg		Call
Canon Innova Book 150	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Canon Innova Book 200LE	4Meg/8Meg/16Meg/24Meg/32Meg		69/99/179/419/Call
Canon Innova Book 300, 350, 370	4Meg/8Meg/16Meg/24Meg/32Meg		89/119/219/419/Call
Canon Innova 486 10	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Canon Notepad 486 SL	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Canon Notepad 486 25, 25 100	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Canon Notepad 486SX 475mhz	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
CTC Nutopia Ultra Hebdo	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
CTC Nutopia VP	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Dell Latitude LX 4100C MX, MC, M	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Dell Latitude XPi	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Dell Latitude XP 475 4100, 4100CX	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Dell Latitude 486 425, 433C 433CX 450, 466CX	4 Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
DTK DTN 47 100P 5/90	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Epson ActionNote 900, 900C, 980Cx	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Epson ActionNote 700, 700C, 700Cx	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Epson ActionNote 5000	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Epson ActionNote 4000 Notebook	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Epson ActionNote 4000, 4000LC, 486LC/2-50	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Epson Equity 410 Carmel	4Meg/8Meg/16Meg/24Meg/32Meg	PCA 00053-0001	79/119/219/419/Call
Fujitsu 5000 LS	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Fujitsu 5000 Express Series	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Gateway 2000 Colorbook 4/33	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Gateway 2000 Nomad 425LS/SX	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Gateway 2000 486 Handbook or Liberty	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Gateway 2000 Solo Series	4Meg/8Meg/16Meg/24Meg/32Meg		89/129/219/419/Call
HP Omnibook 300, 425	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
HP Omnibook 530, 600	4Meg/8Meg/16Meg/24Meg/32Meg		89/119/219/419/Call
HP Omnibook 4000	4Meg/8Meg/16Meg/24Meg/32Meg		89/119/219/419/Call
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Leading Edge Aries 2000	4Meg/8Meg/16Meg/24Meg/32Meg		119/219/419/Call
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NEC versa 4000 4050 4060	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
NEC Versa 6000	4Meg/8Meg/16Meg/24Meg/32Meg		89/129/219/419/Call
Packard Bell 386SX 286	4Meg/8Meg/16Meg/24Meg/32Meg	286, 386SX	79/119/219/419/Call
Packard Bell 9000	4Meg/8Meg/16Meg/24Meg/32Meg		89/129/219/419/Call
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Panasonic CF-V41 CF-940	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Panasonic CF-V41	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Zeos Pantera	4Meg/8Meg/16Meg/24Meg/32Meg		79/119/219/419/Call
Zeos Pantera 4/33	4Meg/8Meg/16Meg/24Meg/32Meg	MBC-16MEM32	89/129/219/419/Call
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Sharp Actius 500, 5000, 6000, 6741	4Meg/8Meg/16Meg/24Meg/32Meg		89/129/219/419/Call
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Toshiba 3000 3005 3010 3020	4Meg/8Meg/16Meg/24Meg/32Meg		89/129/219/419/Call
Toshiba 3100 3105 3110 3115	4Meg/8Meg/16Meg/24Meg/32Meg		89/129/219/419/Call
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```
'*********************************************************
' Code placed in the Form's "On Load" event
'*********************************************************
Private Sub Form_Load()
Me!ctlLastVisit = "Unknown"  ' Set the control's default
                             ' text

' Set the root key to "HKEY_LOCAL_MACHINE"
MyRegControl.hKey = regHkeyLocalMachine

' Set the subkey to examine
MyRegControl.Subkey = "Software\My Company\My
➥Application\1.0"

If MyRegControl.ValueExists("LastVisit") Then
 Me!ctlLastVisit = MyRegControl.VALUES("LastVisit").Value
End If
End Sub

'*********************************************************
' Code placed in the Close button's "On Click" event
'*********************************************************
Private Sub ctlCloseButton_Click()
DoCmd.Close    ' Close the form
End Sub

'*********************************************************
' Code placed in the Form's "On Close" event
'*********************************************************
Private Sub Form_Close()
' Set the root key to "HKEY_LOCAL_MACHINE"
MyRegControl.hKey = regHkeyLocalMachine

' Set the initial subkey to "Software"
MyRegControl.Subkey = "Software"
'
' Check for our key. If it's not there, add it
'
If Not MyRegControl.KeyExists("My Company\My
➥Application\1.0") Then
  MyRegControl.Keys.Add "My Company\My Application\1.0", ""
End If

' Set the subkey to modify
MyRegControl.Subkey = "Software\My Company\My
➥Application\1.0"
'
' Check for our named value. If it's not there, add it
'
If Not MyRegControl.ValueExists("LastVisit") Then
  MyRegControl.VALUES.Add "LastVisit", regTypeSz, " "
End If
'
' Update the last visit date and time
'
MyRegControl.VALUES("LastVisit").Value = Format(Now,
➥"dddddd ttttt")
DoCmd.Close  ' Close the form
End Sub
```

FIGURE 1: *The VBA code, shown here, belongs to the Welcome form (Figure 2). It demonstrates how to use the Wright Registry Control to read and write to the Windows 95 registry. When the Welcome form is opened, the form's On Load event code displays the last date and time the form was used. The date and time value is updated in the registry by the code in the Close button's On Click event.*

form either to "Unknown" or to the LastVisit value in the registry, if it exists. So you set the Hkey property to HKEY_LOCAL_MACHINE and the Subkey property to "Software\My Company\My Application\1.0" (which follows the Windows guidelines for naming and placing these things in the registry hierarchy). At this point, the Keys and Values collections are populated with items corresponding to your subkey. Next, you check for the "LastVisit" value by using the Wright Registry Control's ValueExists method. If it exists, you assign its value to the ctlLastVisit text-box control on your form by taking the Value property of the item in the Values collection with the name "LastVisit." If it doesn't exist, ctlLastVisit stays "Unknown."

When you close the Welcome form by clicking on the Close button, the second procedure in Figure 1 is fired. This code uses the DoCmd.Close method to close the form, causing the form's Close event to fire, which executes the third procedure in Figure 1. It uses the Wright Registry Control's KeyExists method to look for your subkey. If that's not found, the Add method is used to add the subkey. Next, similar logic is used to look for the "LastVisit" value and add it, if it doesn't already exist. Finally, the "LastVisit" value in the registry is updated with a nicely formatted current date and time.

FIGURE 2: *Using the Wright Registry Control, you can read from and write to the Windows 95 registry from your 32-bit Visual Basic and Access programs. This Welcome form displays and updates a value in the registry (as shown by the sample code in Figure 1).*

The Wright Registry Control is shareware with a registration fee of $19.95. Registered owners receive a password that removes the "reminder" screen that pops up every time the control is loaded. Registered owners are also allowed to redistribute the control in their own applications royalty-free. For more information, send e-mail to *lpwright@aol.com* or, through CompuServe, at 74001,2244. You can download the evaluation version on the World Wide Web at *http://www.wrightfutures.com* or on CompuServe in the MSACCESS or MSBASIC Forums.—*Sal Ricciardi*

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4MB X 32 - 60NS EDO SIMMS	152
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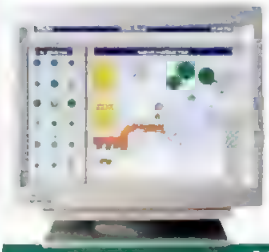

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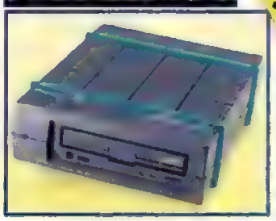

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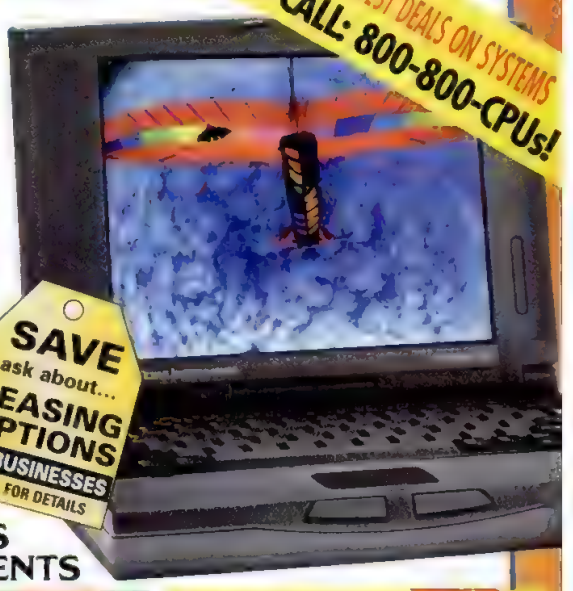

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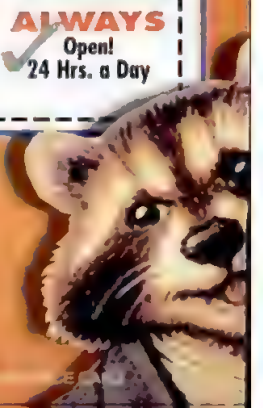

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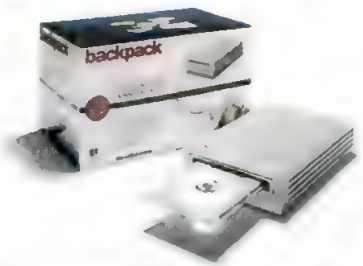

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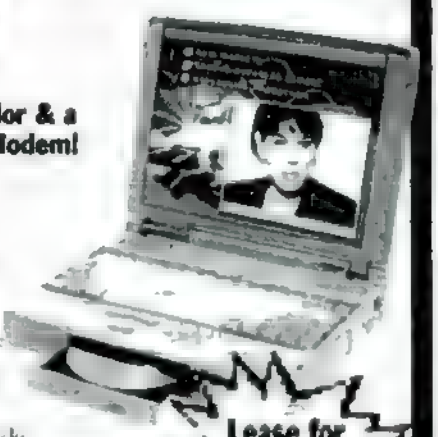

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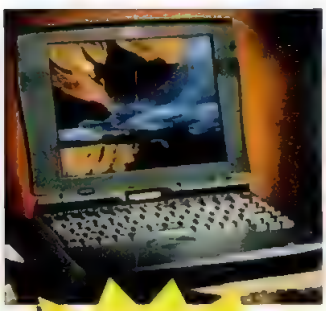

75MHz Pentium®, 10.4" dual scan, 8MB/500MB
$1,965.99
5Ø1788-3Ø1

Ascentia J Series

The new personal notebook. Power and versatility in one!

- Up to 133MHz Pentium® processor
- 10.4" color display
- 8MB RAM expandable to 40MB
- Up to 800MB hard drive
- Integrated 14.4Kbps data/faxmodem
- 2 Type II or 1 Type III PC Card slots
- Lithium Ion battery
- 3 year manufacturer's warranty

AST Ascentia Notebooks

Processor	Screen	RAM/HDD	Product Code	Price
Ascentia J Series				
75MHz Pentium®	10.4" Dual Scan SVGA	8MB/500MB	5Ø1788-3Ø1	$1,965.99
75MHz Pentium®	10.4" Dual Scan SVGA	8MB/800MB	5Ø1788-4Ø1	2,159.99
100MHz Pentium®	10.4" Dual Scan SVGA	8MB/800MB	5Ø1945-4Ø1	2,355.99
100MHz Pentium®	10.4" Active Color SVGA	8MB/800MB	5Ø1946-4Ø1	2,845.99
133MHz Pentium®	10.4" Active Color SVGA	8MB/800MB	5Ø1947-4Ø1	3,315.99
Ascentia P Series				
100MHz Pentium®	11.3" Dual Scan SVGA	8MB/800MB	5Ø1996-3Ø1	$3,315.99
100MHz Pentium®	11.3" Dual Scan SVGA	8MB/1.2GB	5Ø1996-4Ø1	3,789.99
133MHz Pentium®	11.3" Active Color SVGA	8MB/800MB	5Ø1997-3Ø1	4,315.99
133MHz Pentium®	11.3" Active Color SVGA	8MB/1.2GB	5Ø1997-4Ø1	4,739.99

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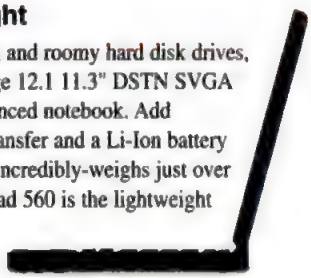
ThinkPad® 560

The lightweight that's a heavyweight

There's a choice of powerful Pentium® processors, and roomy hard disk drives, 8MB up to 40MB RAM, PCI architecture and huge 12.1 11.3" DSTN SVGA displays that tell you ThinkPad 560 is a very advanced notebook. Add integrated infrared for wireless printing and file transfer and a Li-Ion battery that comes standard. All of this in a package that-incredibly-weighs just over four pounds. The conclusion is inevitable: ThinkPad 560 is the lightweight notebook that performs like a heavyweight.



- Pentium® 100MHz processor
- 11.3" DSTN dual scan color display
- 8MB RAM expandable to 40MB
- Up to 1.08GB hard drive
- 2 Type II or 1 Type III PC Card slots
- Weighs 4.1lbs. and Measures 1.2"

IBM Notebook Models

Model	Processor	Screen	RAM/HDD	CD-ROM	Product Code	Price
ThinkPad 365E	5x86 100MHz	10.4" Dual Scan	8MB/540MB	—	IBT2625W9A	$1,999.99
ThinkPad 365ED	5x86 100MHz	10.4" Dual Scan	8MB/540MB	4XCD	IBT2625W9G	2,499.99
ThinkPad 365X	100MHz Pentium®	10.4" Dual Scan	8MB/810MB	—	IBT26256E7	2,649.99
ThinkPad 365XD	100MHz Pentium®	10.4" Dual Scan	8MB/810MB	4XCD	IBT26256E3	2,949.99
ThinkPad 365X	100MHz Pentium®	10.4" Active Color	8MB/810MB	—	IBT26257E7	3,049.99
ThinkPad 365XD	120MHz Pentium®	11.3" Dual Scan	8MB/1.08GB	4XCD	IBT2625EEF	3,499.99
ThinkPad 365XD	120MHz Pentium®	10.4" Active Color	8MB/1.08GB	4XCD	IBT2625DEF	3,899.99
ThinkPad 760LEL	100MHz Pentium®	11.3" Dual Scan	8MB/810MB	—	IBT9547U6G	3,399.99
ThinkPad 760ELD	100MHz Pentium®	12.1" Active Color	8MB/810MB	4XCD	IBT9547U3F	4,499.99
ThinkPad 760LEL	120MHz Pentium®	11.3" Dual Scan	8MB/810MB	—	IBT9547U6F	3,599.99
ThinkPad 760EL	120MHz Pentium®	12.1" Active Color	8MB/1.08GB	—	IBT9547U4F	4,899.99
ThinkPad 760E	120MHz Pentium®	12.1" Active Color	8MB/810MB	—	IBT9546U4B	4,999.99
ThinkPad 760E	120MHz Pentium®	12.1" Active Color	8MB/1.2GB	—	IBT9546U3B	5,299.99
ThinkPad 760E	133MHz Pentium®	12.1" Active Color	16MB/1.08GB	—	IBT9546U4A	5,999.99
ThinkPad 760E	133MHz Pentium®	12.1" Active Color	16MB/1.2GB	—	IBT9546U3A	6,999.99
ThinkPad 560	100MHz Pentium®	11.3" Dual Scan	8MB/810MB	—	IBT264Ø5ØA	2,699.99
ThinkPad 560	120MHz Pentium®	12.1" Active Color	8MB/810MB	—	IBT264ØEØA	3,749.99
ThinkPad 560	133MHz Pentium®	12.1" Active Color	8MB/1.08GB	—	IBT264ØFØE	4,309.99

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U.S. Robotics Modems

Description	Type	Dat/Fax Rate	Product Code	Price
Sportster Models				
Sportster WinModem 33.6	Internal	33.6/14.4	MBUSR1125	$109.99
Sportster "Classic" 33.6	Internal	33.6/14.4	MBUSRSP34I	149.99
Sportster "Classic" 33.6	External	33.6/14.4	MBUSRSP34E	169.99
Sportster Voice 33.6	Internal	33.6/14.4	MBUSR1171	169.99
Sportster Voice 33.6	External	33.6/14.4	MBUSR1172	189.99
Sportster Vi 33.6, DSVD	Internal	33.6/14.4	MBUSRVI28D	229.99
Courier Models				
Courier V. Everything	Internal	33.6/14.4	MBUSR1223	249.99
Courier V. Everything	External	33.6/14.4	MBUSR1224	289.99

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Kingston TECHNOLOGY CORPORATION

Description	8MB Prod. Code	8MB Price	16MB Prod. Code	16MB Price	32MB Prod. Code	32MB Price
Toshiba						
Satellite Pro 400, 100	KTT400Ø/8	$189.99	KTT400Ø/16	$329.99	KTT400Ø/32	$649.99
Tecra 700 CS, CT	KTT70Ø/8	139.99	KTT70Ø/16	259.99	KTT70Ø/32	489.99
Portege 610CT, 410, 710, 720	KTT610/8	189.99	KTSP16MB	329.99	KTT610/32	649.99
Tecra 500 & Portege 650CT	KTT650/8	159.99	KTT650/16	309.99	—	—
AST Ascentia						
J10, J30, J50	KTASTJ8	189.99	KTASTJ16	369.99	KTASTJ32	699.99
P Series	KTASTP8	159.99	—	—	—	—
IBM Thinkpad						
365 Series	—	—	KTM356/16	399.99	—	—
760 C, CD, L, LD	KTN760/8	209.99	KTN760/16A	409.99	KTN760/32	1,399.99
701C	KT353Ø56	189.99	KT353Ø57	399.99	KT727444	1,399.99
760 E, EL, ED, ELD	KT760E/8	209.99	KT760E/16	409.99	—	—
Texas Instruments						
Travelmate 5000, 5100, 5200	KT277787	199.99	KT277786	389.99	—	—
Extensa 550, 560, 570	KTI550/8	189.99	KTI550/16	379.99	KTI550/32	699.99
Travelmate 5300	KTI530Ø/8	209.99	KTI530Ø/16	399.99	—	—

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- 3 year manufacturer's warranty

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- 16.6MB/Sec. transfer rate
- 3.5" 1" form factor/height
- Enhanced IDE interface
- 3 year manufacturer's warranty

SCSI Hard Drives

Capacity	Manufacturer	Model	Interface	Prod. Code	Price
1050MB	Seagate	Hawk 2XL	Ultra SCSI	ST31Ø55N	$349.99
1050MB	Seagate	Hawk 2XL	Ultra Wide SCSI	ST31Ø55W	389.99
2100MB	Micropolis	Aries	Fast SCSI-2	MC4421S	449.99
2100MB	Micropolis	Taurus	Fast SCSI-2	MC4221S	549.99
2100MB	Micropolis	Taurus	Fast Wide SCSI-2 A/V	MC4221AVW	749.99
2100MB	IBM	Ultrastar	Fast SCSI-2	IB94G3Ø54	1,049.99
2100MB	IBM	Ultrastar	Fast Wide SCSI-2	IB94G3Ø55	1,049.99
2147MB	Seagate	Barracuda 2LP	Fast SCSI-2 A/V	ST3255ØN	749.99
2147MB	Seagate	Barracuda 2LP	Fast Wide SCSI-2 A/V	ST3255ØW	799.99
2149MB	Seagate	Hawk 2XL	Ultra SCSI	ST32155N	599.99
2149MB	Seagate	Hawk 2XL	Ultra Wide SCSI	ST32155W	639.99
2149MB	Seagate	Hawk 2XL	Ultra Wide SCSI SCA	ST32155WC	639.99
2150MB	Quantum	Atlas	Fast Wide SCSI-2	QUXP3125W	719.99
2150MB	Seagate	Barracuda 4LP	Ultra SCSI	ST32171N	*CALL*
2150MB	Seagate	Barracuda 4LP	Ultra Wide SCSI	ST32171W	*CALL*
2160MB	IBM	Ultrastar ES	Fast SCSI-2	IBØ7H1124	549.99
2160MB	IBM	Ultrastar ES	Ultra SCSI	IBØ7H1126	559.99
2160MB	IBM	Ultrastar ES	Ultra Wide SCSI	IBØ7H1128	579.99
4294MB	Seagate	Hawk 4	Fast SCSI-2 A/V	ST1523ØN	949.99
4294MB	Seagate	Hawk 4	Fast Wide SCSI-2 A/V	ST1523ØW	989.99
4294MB	Seagate	Barracuda 4	Fast SCSI-2 A/V	ST1515ØN	999.99
4294MB	Seagate	Barracuda 4	Fast Wide SCSI A/V	ST1515ØW	1,029.99
4294MB	Seagate	Barracuda 4	Fast Wide SCSI-2/SCA	ST1515ØWC	1,049.99
4300MB	Micropolis	Capricorn	Fast SCSI-2	MC3243S	899.99
4300MB	Quantum	Atlas	Fast SCSI-2	QUXP343ØS	989.99
4300MB	Quantum	Atlas	Fast Wide SCSI-2	QUXP343ØW	999.99
4300MB	Micropolis	Capricorn	Fast Wide SCSI-2 A/V	MC3243AVW	1,099.99
4350MB	Seagate	Barracuda 4LP	Ultra SCSI	ST34371N	*CALL*
4350MB	Seagate	Barracuda 4LP	Ultra Wide SCSI	ST34371W	*CALL*
4500MB	IBM	Ultrastar/XP	Fast Wide SCSI-2	IB94G3Ø57	1,399.99
4500MB	IBM	Ultrastar/XP	Fast SCSI-2	IB94G3195	1,499.99
9090MB	Seagate	Elite 9	Fast SCSI-2 A/V	ST41Ø8ØØN	1,999.99
9090MB	Seagate	Elite 9	Fast Wide SCSI A/V	ST41Ø8ØØW	2,189.99
9090MB	Seagate	Elite 9	Wide Differential A/V	ST41Ø8ØØWD	2,199.99
9100MB	Micropolis	Scorpio	Fast SCSI-2	MC1991	1,799.99
9100MB	Micropolis	Scorpio	Fast Wide SCSI-2 A/V	MC1991AVW	1,999.99
9100MB	Seagate	Barracuda 9	Ultra SCSI	ST19171N	*CALL*
9100MB	Seagate	Barracuda 9	Ultra Wide SCSI	ST19171W	*CALL*

IDE Hard Drives

Capacity	Manufacturer	Model	Interface	Prod. Code	Price
540MB	Western Digital	Notebook	IDE	WDAL254Ø	$159.99
541MB	Seagate	ST3541A	Fast-ATA-2	ST3541A	149.99
631MB	Seagate	Medalist XE	Fast-ATA	ST363ØA	159.99
810MB	Seagate	Marathon	Fast-ATA-2	ST9816AG	299.99
810MB	Toshiba	Slimline	Fast-ATA	MK1926FCV	329.99
850MB	Seagate	Medalist 850	Fast-ATA-2	ST385ØA	169.99
850MB	Western Digital	Caviar	Enhanced IDE	WD285ØA	179.99
850MB	Quantum	Trailblazer	Fast-ATA-2	QUTR85ØA	185.99
1050MB	Western Digital	Hawk 2XL	Ultra SCSI	ST31Ø55N	349.99
1080MB	Western Digital	Caviar	Enhanced IDE	WD21ØØØA	199.99
1082MB	Seagate	ST31081A	Fast-ATA-2	ST31Ø81A	185.99
1090MB	Fujitsu	Winchester	Fast-ATA-2	FJ1614A	179.99
1275MB	Seagate	ST31276A	Fast-ATA-2	ST31276A	195.99
1280MB	Western Digital	Caviar	Enhanced IDE	WD212ØØA	209.99
1280MB	Quantum	Fireball	Fast-ATA-2	QUFB128ØA	219.99
1282MB	Seagate	Medalist SL	Fast-ATA-2	ST5127ØA	199.99
1286MB	Quantum	Bigfoot	Fast-ATA-2	QUBF1286A	205.99
1300MB	Toshiba	Slimline	Fast-ATA	MK13Ø1MAV	549.99
1300MB	Toshiba	Notebook	Fast-ATA	MK272ØFC	559.99
1336MB	Maxtor	Durango	Enhanced IDE	MX71336A	209.99
1620MB	Western Digital	Caviar	Enhanced IDE	WD316ØØA	229.99
1623MB	Seagate	ST31621A	Fast-ATA-2	ST31621A	219.99
1670MB	Maxtor	Durango	Enhanced IDE	MX71626A	235.99
1700MB	IBM	Deskstar	Enhanced IDE	IBØ6H8724	299.99
1708MB	Quantum	Sirocco	Fast-ATA-2	QUSR17Ø8A	259.99
2004MB	Maxtor	Durango	Enhanced IDE	MX72ØØ4A	285.99
2100MB	Toshiba	Notebook	Fast-ATA	MK21Ø1MAN	649.99
2113MB	Seagate	Medalist	Fast-ATA-2	ST3214ØA	279.99
2113MB	Western Digital	Caviar	Enhanced IDE	WD321ØØA	299.99
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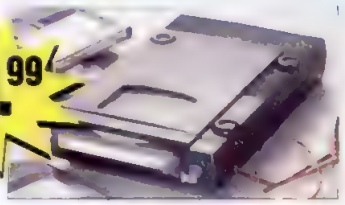

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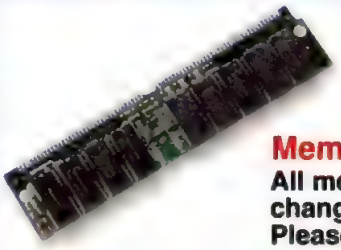

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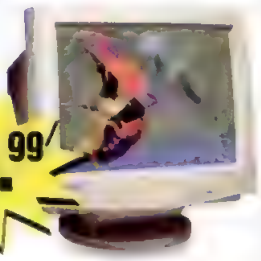

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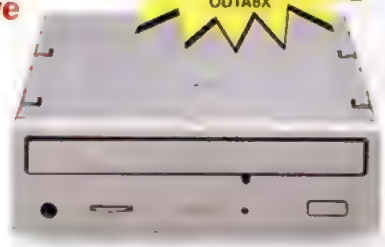

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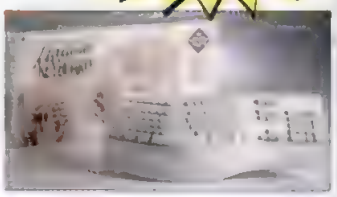

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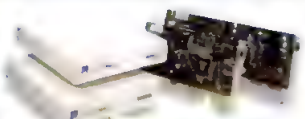

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USR Sportster Classic 33.6/14.4 Int MBUSRSP34I	149.99
USR Sportster Classic 33.6/14.4 Ext MBUSRSP34E	169.99
USR Voice 33.6/14.4 Int MBUSR1171	169.99
USR Voice 33.6/14.4 Ext MBUSR1172	189.99
USR VI 33.6/14.4 DSVD Int MBUSRV28D	229.99
Motorola Bitsurfer Pro ISDN Ext MBMOTIPRO	359.99
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HP LaserJet 5L-FS HPL5L	499.99
HP DeskJet 600C HPDJ600C	199.99
HP DeskJet 855Cxi HPDJ855CXI	499.99
Xerox X4508 Laser XE4509	689.99
Canon BubbleJet 210 CNBJC210	199.99
Canon BubbleJet 610 CNBJC610	429.99
Epson Stylus Pro EPSTYPRO	449.99
Lexmark Optra E LEX4029PLA	549.99
Texas Instrument WIN4 TEX1031	329.99

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APC Back-UPS Pro 420 PnP UPAPCBK42P	239.99
APC Back-UPS Pro 650 PnP UPAPCBK65P	299.99
APC Smart-UPS 420 V/S UPAPCVS420	249.99
APC Smart-UPS 650 V/S UPAPCVS650	299.99
APC Smart-UPS 1000 V/A UPAPCS1000	489.99
APC Smart-UPS 1400 V/A UPAPCS1400	619.99
Tripp Lite OmniSmart PnP UP-OMN280	139.99
Tripp Lite OmniSmart PnP UP-OMN420	209.99
Tripp Lite BC Internet 325 UP-I325	129.99
Tripp Lite BC Internet 450 UP-BCI450	149.99
Tripp Lite BC Professional 550 UP-BCPR550	189.99
Tripp Lite BC Professional 675 UP-BCPR675	219.99
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Seagate	1.6 Gig 5400RPM $245
Seagate	2.1 Gig 5400RPM $274
Quantum	3.2 Gig 4500RPM $369

CD RECORDERS

Yamaha 2x4 $579 4x4 $959
PC Int kit which includes drive, controller, software, and 5 disks.

HP 2x4 $849
PC Int kit which includes drive, controller, software, and 1 disk.

Smart & Friendly 2x2 $599 4x4 $1375
PC Int kit which includes drive, controller, software, and 1 disk.

Pinnacle Micro 2x4 $859
PC Int kit which includes drive, controller, software, and 2 disks.

Smart Storage Solutions 2x4 $669 4x4 $1079
PC Int kit which includes drive, controller, software, and 5 disks.

CD ROM DRIVES

• SCSI DRIVES •

Brand	Model	Spin	Speed	Internal	External
NEC	CDR222	4X	200ms	$99	$189
Sony	CDU76S	4X	250ms	$119	$209
Pioneer	DRU124X	4.4X	140ms	$109	$199
Plextor	PX43CE	4.5X	130ms	$239	$329
Teac	CD56S	6X	160ms	$219	$309
Plextor	PX63CS	6X	145ms	$279	$369
Philips	PC80S	8X	195ms	$229	$319
NEC	CDR1410	8X	145ms	$259	$349
Toshiba	XM5601B	8X	145ms	$269	$359
Plextor	PX83CS	8X	115ms	$389	$479

Mac kits also available.

• ATAPI DRIVES (IDE) •

Brand	Model	Spin	Speed	Internal	Int Kit
OEM	IDECD4X	4X	200ms	$65	$80
NEC	CDR1300	6X	145ms	$99	$114
Mitsumi	CRMCFX800	8X	150ms	$125	$140
Teac	CD58E	8X	110ms	$125	$140
Toshiba	XM5602B	8X	145ms	$129	$160
Sony	CDU311	8X	160ms	$129	$160
New	IDECD10X	10X	130ms	$249	$264

Sound Blaster 16 PnP $99 Sound Blaster 32Pnp $155

• CD CHANGERS •

CD ROM Changers allow you to have multiple disks online at one time. No more switching disks.

Brand	Model	Disks	Spin	Speed	Price
		Internal IDE			
New	CDR3X4	3	4X	230ms	$99
NEC	CDR4X4	4	4X	250ms	$179
		External SCSI			
Pioneer	DRM-624X	6	4.4X	190ms	$299
Pioneer	DRM-1804X	18	4X	300ms	$1899

• CD ROM TOWERS •

For fast access to multiple CD's at one time. Perfect for schools, BBS, networks, and more. Toll free support. Custom configurations available. Call.

	4 Drives	7 Drives		
4X	200ms	NEC	$759	$1259
4.4X	140ms	Pioneer	$799	$1299
4.5X	130ms	Plextor	$1499	$2529
6X	160ms	Teac	$1439	$2439
6X	150ms	NEC	$1559	$2629
6X	145ms	Plextor	$1699	$2899
8X	195ms	Philips	$1459	$2499
8X	145ms	NEC	$1559	$2629
8X	145ms	Toshiba	$1999	$3449
8X	115ms	Plextor	$2299	$3999

2 to 21 drive configurations available. Call.

PARALLEL DRIVES

High quality! Plugs into any parallel printer port. Output for concurrent printer use. EPP compliant for high performance.

Hard Drives (3yr warranty on drive mechanism)

1Gig [SSSPP1GIG]	$349	2Gig [SSSPP2GIG]	$479
1.6Gig[SSSPP1.6GIG]	$429	2.5Gig [SSSPP2.5GIG]	$525

CD ROM Drives

4X [SSSPP4XCD]	$179	8X [SSSPP8XCD]	$299
6X [SSSPP6XCD]	$229	10X [SSSPP10XCD]	$489

SCSI HARD DRIVES

SCSI	Speed	RPM	Brand	Model	Price
1050MB	9ms	5400	Seagate	ST31055N	$339
1080MB	11ms	5400	Seagate	ST51080N	$249
2050MB	8.5ms	7200	Micropolis	MC4221	$544
2050MB	8.5ms	7200	Micropolis	MC4221AV	$600
2147MB	9ms	5400	Micropolis	MC4421	$399
2147MB	9ms	5400	Seagate	ST32155N	$509
2147MB	8ms	7200	Seagate	ST32550N	$729
4290MB	8ms	7200	Seagate	ST15150N	$989
4290MB	9ms	5400	Seagate	ST15230N	$899
4294MB	8.9ms	7200	Micropolis	MC3243	$799
4294MB	8.9ms	7200	Micropolis	MC3243AV	$889
4300MB	8.6ms	7200	Quantum	XP34300	$900
9080MB	11ms	5400	Seagate	ST410800N	$1880
9091MB	12ms	5400	Micropolis	MC1991	$1619
9091MB	12ms	5400	Micropolis	MC1991AV	$1749
9091MB	8.5MS	7200	Micropolis	MC3391	$1799
WIDE SCSI					
1050MB	8.5ms	7200	Quantum	XP31070W	$329
1050MB	9ms	5400	Seagate	ST31055W	$389
2050MB	8.9ms	7200	Micropolis	MC4221W	$630
2050MB	8.9ms	7200	Micropolis	MC4221WAV	$689
2147MB	8ms	7200	Seagate	ST32550W	$789
2150MB	9ms	5400	Seagate	ST32155W	$569
4294MB	8.9ms	7200	Micropolis	MC3243W	$889
4294MB	8.5ms	7200	Micropolis	MC3243WAV	$979
4294MB	8ms	7200	Seagate	ST15150W	$1029
4300MB	8.6ms	7200	Quantum	XP34300W	$939
9080MB	11ms	5400	Seagate	ST410800W	$2079
9091MB	8.5ms	7200	Micropolis	MC3391W	$1859
9100MB	12ms	5400	Micropolis	MC1991W	$1709
9100MB	12ms	5400	Micropolis	MC1991WAV	$1839

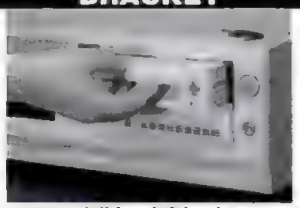
TAPE DRIVE SALE

Capacity	Brand & Model	Price
	• SCSI •	
2-4GB	Seagate TSM4000	$309
4-8GB	Seagate TST8000	$399
	• 4mm DAT DRIVES •	
2GB	Hewlett Packard C1534	$609
2GB	Seagate C4320RT	$599
2-4GB	Seagate C4324RP	$679
2-4GB	Hewlett Packard C1536	$699
4-8GB	Seagate C4326NP (DDS2)	$859
4-8GB	Hewlett Packard C1533A	$879
24-48GB	HP External 6 tape loader C1553AX	$2379
	• 8mm DAT DRIVES •	
3.5-7GB	Exabyte EXB8205XL	$1269
7-14GB	Exabyte EXB8700LT	$1149
	• QIC •	
800MB		$141
1GB		$159
1.7GB		$219
3.2GB		$249
4.4GB		$259

Seagate

Save $10 on these Seagate tape backups with any hard drive purchase.

REMOVABLE DRIVE BRACKET



Converts any 3 1/2" hard drive into a removable drive. Great for transportability, data interchange, or security needs. Extremely high quality construction. Metal cartridge and frame, cooling fan, SCSI unit has ID select on the cartridge. Qty discounts available. Weather resistant carrying case $55.

	System	Extra Cartridge	Extra Frame
IDE	$79	$39	$49
SCSI	$85	$40	$54
WIDE SCSI	$129	$64	$75

IDE HARD DRIVES

IDE	Speed	RPM	Brand	Model	Price
540MB	14ms	4480	Maxtor	M7541A	$165
635MB	12.5ms	4500	Seagate	ST3636A	$170
639MB	11ms	4500	Western Digital	AC2635	$160
850MB	10ms	4500	Western Digital	AC2850	$175
1080MB	11ms	5400	Seagate	ST51080A	$190
1084MB	14ms	4480	Maxtor	M71084A	$195
1090MB	11ms	4500	Fujitsu	M1614T	$165
1250MB	15ms	3600	Quantum	BF1250A	$185
1280MB	12ms	5400	Quantum	FB1280A	$215
1280MB	10ms	5200	Western Digital	AC21200A	$192
1282MB	10.5ms	5400	Seagate	ST51270A	$192
1330MB	12ms	4480	Maxtor	M71336A	$199
1624MB	10ms	5200	Western Digital	AC31600	$229
1625MB	10.5ms	5400	Seagate	ST31640A	$249
1626MB	12ms	4480	Maxtor	M71626AP	$229
1700MB	11ms	4500	Quantum	SR31700A	$229
2004MB	12ms	4480	Maxtor	M72004A	$275
2100MB	10ms	5200	Western Digital	AC32100	$289
2167MB	10ms	5400	Seagate	ST32140A	$275
2168MB	10.5ms	4500	Quantum	TM32160A	$289
2500MB	15ms	3600	Quantum	BF2500A	$265
2500MB	11ms	4500	Quantum	SR32550A	$325
2559MB	11ms	5200	Western Digital	AC32600	$339
3254MB	10.5ms	4500	Quantum	TM33200A	$369

REMOVABLES

OPTICAL DRIVES

230MB	Fujitsu IDE Bare	$339
230MB	Fujitsu SCSI Bare	$419
640MB	Fujitsu SCSI	Call
650MB	Panisonic PD combination optical & 4X CD ROM	Call
2.6Gig	Maxoptix Int/Ext	$1699/$1799
2.6Gig	HP Int/Ext	$2125/$2225

SYQUEST DRIVES

EZ 135MB •13.5ms, 3600rpm, 128K buffer, 3 1/2" drive
Internal IDE with disk / External SCSI with disk $139/$139
External parallel port with 1 disk $139
NEW 230MB Flyer $299
270MB • 13.5ms, 3600rpm, 128K buffer, 3 1/2" drive
Internal IDE (SQ3270A)/ with 1disk (S3270AC) $149/$199
External for parallel port with 1 disk $399
SCSI drive (SQ3270S)/SCSI external(S3270X) $199/$259
200MB •15.7ms, 3220rpm, 64K buffer, 5 1/4" form factor.
SCSI drive (SQ5200)/SCSI external(SQ5200CX) $339/$399

IOMEGA DRIVES

100MB ZIP • 3.5" x 1" high form factor
External SCSI w/ 1 disk $189
Parallel External w/ 1 disk $189
1 Gig JAZ • 3.5" x 1" high form factor
Internal SCSI w/ 1 disk $489
External SCSI w/ 1 disk $589

Adaptec controller AIS05CDKIT only $49 when purchased with Zip or Jaz drive

DISCOVER VISA

MegaHaus
2201 Pine Drive, Dickinson, Texas 77539
(713)534-3919 FAX (713)534-6580

Prices & specifications subject to change without notice. Shipping charges are non-refundable. Returns must be in new condition and original packaging. Defective items may not be returned w/ intentional software/personal modifications or misuse. All returns subject to 15% restocking fee. All trademarks, registered trademarks, service marks of the respective companies. Personal checks held 14 days. We reserve the right to refuse any sale for any reason. Bundle price good only if sold as priced. ©1996 MegaHaus, Inc.

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DESKTOP COMPUTER MEMORY

COMPAQ

Presario 425, 433, 633, 650, 660, 800C, 800P, 800S, 833, 850, 866
ProLinea MT 4/33s, MT 4/50, MT 4/66, 4/25s, 4/33, 4/50 4/66, 4/33s, enhanced 4/100, 4/33s, 4/50, 4/50s, 4/66, Net 1/25s, Net 1/33s

4MB	141684-001	$69	8MB	161685-001	$139
16MB	149320-001	$299	32MB	149167-001	$469

Presario 5110, 5120, 5124, 5126, 5128, 7120, 7126, 7144, 7176, 7180, 9120, 9124, 9126, 9548, 9564, ProLinea 4100, 4166 S-20MHz, 575MR, 590MR, 5100, 5133, 5120, 5100, 575, 590, ProLinea 450, 5100s, 5120s, 575s, 6150s 6180s, Deskpro 4100, 450, 466, 575MR, 590MR, 5100, 5120, 5133, 575, 590

4MB	172712-001	$49	8MB	172713-001	$99
16MB	172714-001	$199	32MB	172715-001	$429
1MB Video	171617-001				$69
256K Cache	223357-001				$49

Presario 7212, 7222, 7232, 7234, 7240

8MB	236548-001	236512-001			$129
16MB	236548-002, 236513-001				$259
32MB	n/a	$499	64MB	n/a	$799
1MB Video	236709-001				$69

Presario 9232, 9234, 9240, 9250, 9442, 9660

8MB	234567-001	$99	16MB	234568-001	$229
32MB	n/a	$399	64MB	n/a	$899
1MB Video	213922-001				$69

ProLinea 5133 2000/ML, 5150 2000/ML, 5166 2000/ML, 5100 64C/1200 5120 1200 5133 1200/2000 5150 1200/2000, 5166 1200 Deskpro 5133 2000/ML, 5150 2000/ML, 5166 2000/ML, 5100

8MB	243011-001	$129	16MB	243012-001	$259
32MB	243013-001	$489	64MB	243014-001	$799
1MB Video	171617-001				$69
2MB Video	233335-001				CALL
4MB Video	233336-001				CALL

16MB	149969-001	$359	32MB	149912-001	$699
64MB	149913-001	$799	128MB	149914-001	$1699
1MB Video	139167-001				$69

Deskpro XL 450, 466, 560, 566, 5100, 5120, 5133, 575, 590

8MB	148188-001	$129	16MB	148189-001	$259
32MB	148190-001	$469	64MB	148191-001	$799
1MB Video	139167-001				$69

16MB	210948-001	CALL	32MB	228417-001	CALL
64MB	228418-001				CALL
2MB Video	233335-001				CALL
4MB Video	233336-001				CALL

Deskpro XE 4100, 433s, 450, 466

4MB	141684-001	$69	8MB	161685-001	$139
1MB Video	139167-001				$69
256K Cache	194358-002				$49

Deskpro 2/25s, 3/33s, 386/25M, 386/33M, 4/25S, 4/33, 4/66s, 486/33M, 486/50M, 486/66M, 486s/16M, 486s/25M, 486s/33M

4MB	118690-001	$69	8MB	128077-001	$139
512K Video	141336-001				$39
1MB Video	139167-001				$69

DELL

Power Desktop 486 Models

4MB	3103507	$69	16MB	3103625	$229

PowerEdge XE, OptiPlex, Dimension XPS, OmniPlex ME 486 & Performance M/L/T Models

4MB	3103325	$49	8MB	3106083	$99
16MB	3103327	$199	32MB	n/a	$399

Performance ME, OmniPlex Pentium ME, OptiPlex XCR, PowerEdge

8MB	3103335	$139	16MB	3103336	$259
32MB	3103337	$459	64MB	n/a	$799

PowerLine Workstations SE & DE Models

8MB	3103468	$139	16MB	3103469	$259
32MB	3103630	$459			

Dimension XPS & OptiPlex XL/XM/XMT Pentium Models

8MB	3103647	$139	16MB	3103376	$259
32MB	3103375	$459	64MB	3103368	$799

DBCpc MT, XP & MT Models

4MB	FB/PCP4MAA	$69	16MB	FB/PCP4MAB	$239

Station & Ventura Models

4MB	FB/PCVM4AA	$69	8MB	FB/PCVM4AB	$99
16MB	FB/PCVM4AC	$199	32MB	FB/PCVM4AD	$399

GATEWAY 2000

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P5 Series & Family PC P5 Series Models

4MB[PCI]	n/a	$60	8MB[PCI]	n/a	$139
16MB[PCI]	n/a	$259	32MB[PCI]	n/a	$409

IBM

ValuePoint 6384/6472/6482/6484/6692/6694/6381 SI Models

4MB	92G3131	$69	8MB	92G0130	$139
16MB	92G0160	$239	32MB	92G0320	$469

PS/ValuePoint 6384, PS/ Consultant/Essential/Expert Models

4MB	96F9290	$69	16MB	96F9291	$229

PS/ValuePoint 6382/6384/6387 PS/1

Advisor/Consultant/Essential/Expert/Window/Investor Models

8MB	6450128	$69	8MB	6450130	$139
16MB	92G7304	$239			

PC 700 Model 750/6887 Model 730/6877

8MB	92G7318	CALL	16MB	92G7320	CALL
32MB	92G7322	CALL	64MB	92G7324	CALL

PC 700 Model 750/6885/6886 Model 730/6875/6876

4MB	73G3131	$69	8MB	6450130	$139
16MB	92G7204	$229	32MB	92G7205	

80, 9332, 9532

2MB		80P5300, 6450804, 6450808, 6458379			$69
8MB		34F3933, 87P9977, 6451080			$99
8MB		6450129			$139

Expansion Boards for PS/2 Systems

4.6MB w/4MB		6450609			$234
2.4MB w/2MB		34F3077			$309
6.6MB w/4MB		34F3011			$309

NEC

PowerMate & Ready 486 Models

4MB	158-082222-000	$69	16MB	158-082222-000	$139

PowerMate 486 Pentium Models

4MB	OP-410-4003	$69	8MB	OP-410-4004	$99
16MB	OP-410-4005	$199	32MB	OP-410-4006	$399

AST COMPUTER

Bravo LC & MS Pentium Models

8MB	503008-001	$139	16MB	503008-002	$259
32MB	503008-003	$519	64MB	503008-004	$979

Manhattan V & G Models Processor 4/33, 4/33s, 4/50s, 4/66s MTE 4/33, 4/66s, P/60, SE 4/33 SE 4/66s, SE P/60

8MB	501159-002	$109	16MB	501159-003	$309
32MB	501159-004	$599	64MB	501159-005	$749

Bravo LP MT, LC (R) & LC (R), Premmia MX & JI & Advantage! Models

4MB	500987-002	$49	8MB	500987-003	$99
16MB	500987-004	$199	32MB	500987-005	$399

Bravo 4/33 (original), 4/25 Premium II, Premium II,

4MB	500780-004	$79	8MB	500780-001	$129

HEWLETT PACKARD

Netservers & Vectra VL3 Models

8MB	D2974A	$60	8MB	D2975A	$129
16MB	D2676A	$229	32MB	D2298A	$459

Vectra XU/XM3/XM2/XM2/VL3/VE, Multimedia PC & Pavilion Models

4MB	D2690A	$49	8MB	D2691A	$99
16MB	n/a	$199	32MB	n/a	$399

Vectra 486 RM/ST/LE/P/M/M/M/M/M, Models

4MB	D2156A	$60	8MB	D2152A	$129
16MB	D2676A	$239			

digital

Aptiva (all models) & PC 300 Model 330/350

8MB	92G7539	$60	8MB	92G7541	$99
16MB	92G7543	$159	32MB	92G7545	$299
1MB Video	92G7462				$49
256K Cache	92G7251				$79

MICRON

Pro Magnum Series & Power Server Series Models

4MB	n/a	$60	8MB	n/a	$99
16MB	n/a	$199	32MB	n/a	$399
4MB[EDO]	n/a	$60	8MB[EDO]	n/a	$139
16MB[EDO]	n/a	$259	32MB[EDO]	n/a	$469

Packard Bell

Executive Series, Forte Series & Legend Series Models

4MB	n/a	$60	8MB	n/a	$99
16MB	n/a	$199	32MB	n/a	$399

LASER PRINTER MEMORY

HP LaserJet III					
1MB	C2984A				$60
HP LaserJet 5L					
1MB	C3979A	$30	2MB	C3147A	$79
4MB	C3148A	$99	8MB	n/a	$239
HP LaserJet 4/4 Si/4 MP					
2MB	33475B	$79	4MB	33477B	$139
HP LaserJet 5, 5D					
2MB	33444B	$79	4MB	33445B	$139
HP LaserJet 8si, 4, 4M, 4Si, 4SiMX, 8,2300, Deskjet 1200C					
1MB	C2063A	$60	2MB	C2064A	$99
4MB	C2065A	$99	8MB	C2066A	$199
HP LaserJet 4P, 4MP Color LaserJet					
2MB	C3131A	$50	4MB	C3132A	$85
HP Deskjet 500, 500C, 520, 520C, 550C, 560, 560C					
256K	32707B				$40
HP Designjet 5P, 5MP					
4MB	C3132A	$85	8MB	C3133A	$209
HP LaserJet 5, 5N, 5M, 5Si, 5SiMP, 5+5M Color					
2MB	C3131A	$80	4MB	C3132A	$85
8MB	C3133A	$99	16MB	n/a	$209
Okidata OL400					
1MB	70914701				$79
2MB	n/a				$120
Okidata OL400E					
2MB	n/a				$119
4MB	n/a				$169

STANDARD SIMMS

UPGRADES STANDARD SIMMS UPGRADES

30-PIN	72-PIN Non-parity	72-PIN Parity	EDO
1 x 3-70ns (3-chip/1MB) $17	1 x 32-70 (4MB) $45	1 x 36-70 (4MB) $59	1 x 32-60 (4MB) $69
1 x 9-70ns (1MB) $24	2 x 32-70 (8MB) $90	2 x 36-70 (8MB) $112	2 x 32-60 (8MB) $129
4 x 3-70ns (3-chip/4MB) $57	4 x 32-70 (16MB) $199	4 x 36-70 (16MB) $229	4 x 32-60 (16MB) $259
4 x 9-70ns (4MB) $72	8 x 32-70 (32MB) $399	8 x 36-70 (32MB) $469	8 x 32-60 (32MB) $489

First Source International Always Includes Installation Instructions! (on standard simms)

ALWAYS CALL FSI BEFORE YOU BUY!

LAPTOP & NOTEBOOK MEMORY

AST COMPUTER

Ascentia 800N & 810N Models

4MB	501488-001	$99	8MB	501488-002	$159
16MB	501488-003				$399

Ascentia 900N & 910N Models

4MB	501392-001	$99	8MB	501392-002	$159
16MB	501392-003				$429

Ascentia 950N Models

8MB	501728-002	$199	16MB	501728-003	$369

Ascentia J Models

8MB	501984-001	$199	8MB	501985-001	$399
32MB	501986-001				$769

Ascentia P Models

8MB	501013-001	CALL	16MB	501013-002	CALL
32MB	501013-003				CALL

COMPAQ

Contura Aero Models

4MB	190532-001	$99	8MB	190537-001	$199
16MB	190598-001				$469

Contura 4/25, 4/25CX, 4/25c Models

4MB	146320-001	$120	8MB	146521-001	$299
16MB	114653-001				$469

Contura 400, 410, 420, 430 Models

4MB	147653-001	$109	8MB	147655-001	$219
16MB	147657-001				$469

Concerto 4/25, 4/33 Models

4MB	146790-001	$156	8MB	146790-002	$319
16MB	146790-003				$469

LTE Elite Models

4MB	199013-001	$120	8MB	199015-001	$219
16MB	199017-001				$469

Elite Pentium 5000 Models

8MB	213515-001	$289	16MB	213515-002	$439
32MB	213515-003	$839	64MB	213515-004	$1489

Apple Computer

PowerBook 520 & 540 Models

4MB	M1913D/A	$179	16MB	n/a	$259
PowerBook 5300 Models					
8MB	M3750L/A	$149	16MB	n/a	$299
24MB	n/a	$399	32MB	n/a	$479

DELL

Latitude 433 Models

4MB	3103385	$89	16MB	3103386	$469

Latitude 433mx, 450mx/mcx, 475mx, LX 4100/475 Models

4MB	3103418	$139	8MB	n/a	$309
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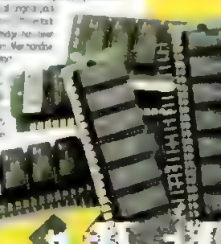

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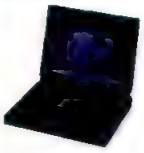

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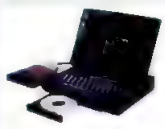

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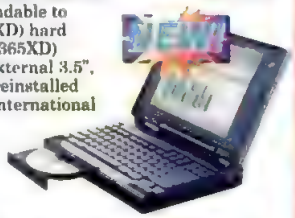

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*Lotus SmartSuite 96 CD-ROM included with all IBM ThinkPads shipping with the Windows® 95 operating system. Diskette copies and hard copy documentation can be ordered for a fee through the IBM fullfillment center at 800-672-6165.

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P30 CSS11 1.2GB hard drive	$3829.10	CDW 65839
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J30 CSS10	$2326.86	CDW 64482
J30 CTS10	$2808.50	CDW 64483
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LAN+28.8 Modem PC Card-Combo	$454.41	CDW 71985
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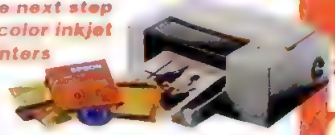

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3C509B Etherlink III 10BT + AUI 5-pack	441.95
3C509B Etherlink III coax	109.75
3C509B Etherlink III coax 10BT	103.89
3C509B Etherlink III combo	122.07
3C509B Etherlink III combo 5-pack	513.67
3C509B Etherlink III PCI 10BT	123.71
3C509B Etherlink III PCI combo	164.85
3C595 Fast Etherlink PCI 10/100BT	161.91
3C16170 Linkbuilder TP/12-port	319.36
3C16670 Linkbuilder FMSII 12-port	511.66

Artisoft

NodeRunner/SI 2000T	71.80
NodeRunner Pro combo	76.33
NodeRunner/SI 2000A	84.98
LANtastic V6.0	74.34
LANtastic V6.0 5-user	304.88
LANtastic V6.0 starter kit coax	226.30
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Intelligent AutoSwitch 4 PCs to 1 printer	35.94
JetLAN/P Plus pocket server	272.28
SNAP starter kit 2 PCs to 1 printer	109.80
SNAP add-on transmitter	39.63

Bay Networks

SynOptics System 800 10BT 8-port hub	204.00
SynOptics System 810M 10BT 8-port hub	536.60

IBM

Token Ring auto adapter 16/4 ISA	212.45
Token Ring MAU multiport	385.99

NETWORKING PRODUCTS

COMPAQ

Netelligent 10BT PCI controller	103.50
Netelligent 10/100BTX PCI controller	139.05
Netelligent 4/16 Token-Ring PCI controller	369.60
Netelligent 2000 10BT repeater	619.70

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EtherExpress 16 10BT 5-pack	458.76
EtherExpress 16 combo	123.25
EtherExpress 16 combo 5-pack	559.37
EtherExpress EISA coax	402.82
EtherExpress MCA 10BT	172.09
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EtherPower 10/100BT PCI	143.72
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EtherPower 10BT 5-pack	506.62
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TigerHub TP6B 6 10BT ports + BNC	181.41
ARCNET 8-port active hub coax	223.86
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TokenCard Elite 16/4	211.74

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Wyse 60 amber/green/white	316.80
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SyQuest

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NEC 4Xc 4X CD 7-disc changer external	342.15
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Sony 4X CD SCSI-2 internal	158.57
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UMAX

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Mag Innovision MX21F 21" .28mm	1484.25
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NEC Versa V 16MB	257.15
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ML590	445.72	OL1200	977.36
ML591	603.87		

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BJC70	293.86	MultiPass C2500 printer/copier/scanner/fax	899.00
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BJC610	429.90		

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HP OfficeJet 350 inkjet fax/copier/printer/scanner	599.00

TEXAS INSTRUMENTS

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microLaser Pro/6	1103.88
microLaser PowerPro/12	1362.58

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540MB EIDE	164.65	1.08GB Fast SCSI-2	281.10
850MB Fast-ATA	187.80	2.14GB Fast SCSI-2	528.91
1.08GB IDE	191.31		

CONNER

631MB Fast-ATA	165.94	2.1GB Fast ATA-2	302.96
1.08GB Fast-ATA2	205.84	2.14GB Fast SCSI-2	736.68
1.06GB Fast SCSI-2	269.73	2.14GB F/W SCSI-2	799.87
1.6GB Fast-ATA2	269.73	4.29GB Fast SCSI-2	981.98
2.0GB Fast SCSI-3	525.45	9GB Fast SCSI-2	1965.49

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631MB Fast-ATA	165.94	2.1GB Fast ATA-2	302.96
1.08GB Fast-ATA2	205.84	2.14GB Fast SCSI-2	736.68
1.06GB Fast SCSI-2	269.73	2.14GB F/W SCSI-2	799.87
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Caviar 853MB EIDE	187.21
Caviar 1.2GB EIDE	225.37
Caviar 1.62GB EIDE	253.46
Caviar 2.1GB EIDE-2	323.72
Caviar 2.5GB EIDE-2	391.32

CONTROLLERS

Acculogic SIDE-3+ w/on-board BIOS	38.77
Acculogic SIDE-4+ w/per 2 serial game	29.16
Adaptec AVA1505 SCSI-2 CD Kit	68.32
Adaptec 2842 VLB SCSI-2	239.11
Adaptec 1542CP SCSI Master Kit	257.93
Adaptec PCI Ultra Wide SCSI Kit	292.33
Adaptec Power Storage ISA Kit	493.02
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Promise EIDE/MAX ISA 2HD on-board BIOS	25.81
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V.34 28.8 external w/fax	209.64

Hayes

ACCURA 144 internal w/fax	79.05
ACCURA 144 external w/fax	92.23
ACCURA 288 V.34 internal w/fax	152.89
ACCURA 288 V.34 external w/fax	168.69
OPTIMA 288 V.34 internal w/fax	231.84
OPTIMA 144 external w/fax	373.02
OPTIMA 288 Business Modem	335.82

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DeskPorte 28.8S V.34 external	169.36
DeskPorte 28.8P V.34 external	205.26

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BitSURFR ISDN adapter external	263.63
BitSURFR Pro ISDN terminal adapter	348.03
ModemSURFR V.34 28.8 internal	145.53
ModemSURFR V.34 28.8 external	161.58
OnlineSURFR V.34 28.8 internal	107.81
OnlineSURFR V.34 28.8 external	123.48

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14.4 Mini-tower w/fax	79.05
V.34 28.8 internal w/fax	141.13
V.34 28.8 Mini-tower w/fax	159.94

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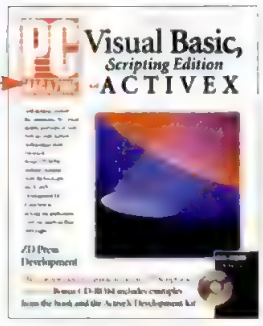

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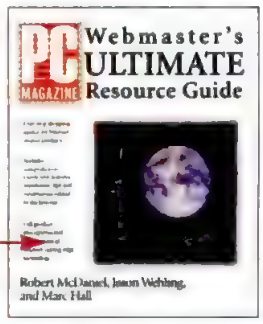

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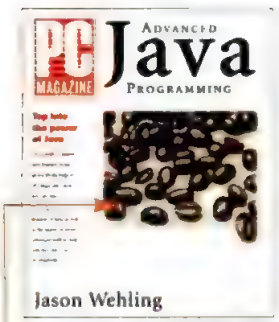

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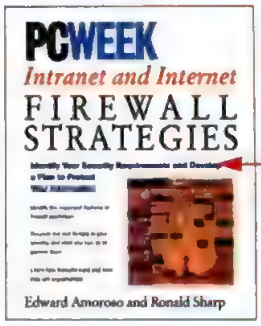

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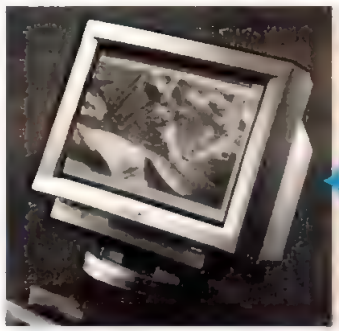

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MB Serenity **	Serenity	256K Writeback	Award	3	4	4	Triton	$125
MB Tranquility*	Serenity	256K Pipeline	AMI	3	4	4	Triton	$155
MB P55CMS-256*	Super Micro	256K Pipeline	AMI	4	4	4	Triton	$185
MB P55T2S-256*	Super Micro	256K Pipeline Burst	AMI	4	4	6	Triton II	$219
MB ENDEAVOR ***	Intel	Upgradable Pipeline	AMI	4	3	4	Triton	$225
MB ATLANTIS***	Intel	Upgradable Pipeline	AMI	4	3	4	Triton	$310

All Pentium 75-200Mhz CPU's are Socket 7 with 273 pins. When using Pipeline Burst or Synchronized Cache you may use EDO memory. *Upgradeable to 512K Pipeline Burst Cache. Add $25.00 **Upgradeable to Pipeline Burst Cache. Get SimmVerters for only $22 each when you buy a Motherboard

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MB P6DNF	Super Micro	Onboard	AMI	4	4	6	Natoma	$875

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1.62 Gig	E-IDE	14ms	64K	3600	3CFS1621A	$250
3 Yr Warranty — Western Digital						
1.28 Gig	E-IDE	10ms	64K VRAM	4500	WDAC21200A	$205
1.62 Gig	E-IDE	9ms	64K VRAM	5200	WDAC31600A	$249
2.10 Gig	E-IDE	10ms	64K VRAM	5200	WDAC32100A	$319
2.50 Gig	E-IDE	10ms	64K VRAM	5200	WDAC32500A	$385
3 Yr Warranty — Maxtor						
1.08 Gig	E-IDE	12ms	128K	4480	4MX71084AP	$195
1.34 Gig	E-IDE	12ms	128K	4480	4MX71336A	$210
1.62 Gig	E-IDE	12ms	128K	4480	4MX71634AP	$219
2.04 Gig	E-IDE	12ms	128K	4480	4MX72004A	$285

NOTEBOOKS

NEC Versa 4000D

Model No.	CPU	Screen	RAM/HD	Price
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4080H	P-120	10.4" Active	8/1Gig	$4960

Hewlitt Packard Omnibook

Model No.	CPU	Screen	RAM/HD	Price
5000 CTS	P-120	10.4" Act SVGA	16/1Gig	$5275
5000 CTS	P-90	10.4" Act SVGA	16/1Gig	$5175
6000 CT	DX2-75	9.5" Active	8/340MB	$2499

Texas Instruments Extensa

Model No.	CPU	Screen	RAM/HD	Price
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TM5100	P-90	10.4" Act SVGA	8/1.2Gig	$3695
TM5200	P-120	11.3" Act SVGA	8/1.2Gig	$4665

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Compaq 9642	$2499	133Mhz	16MB	1.6Gig	4X/28.8
Compaq 9660	$2999	166Mhz	16MB	2.0Gig	6X/28.8

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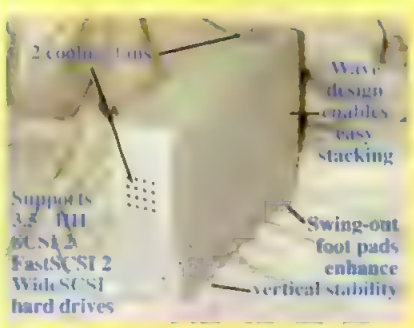

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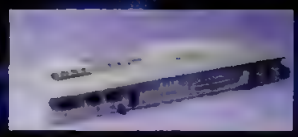

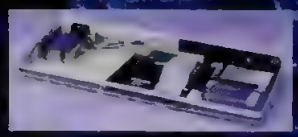

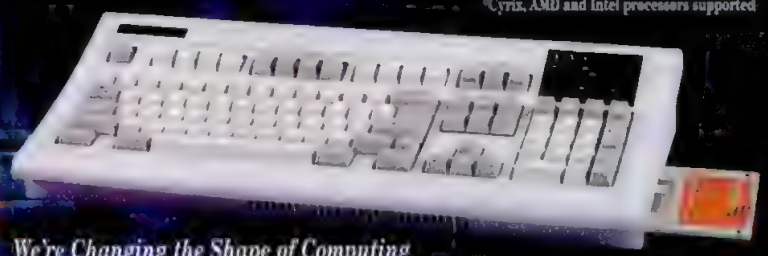

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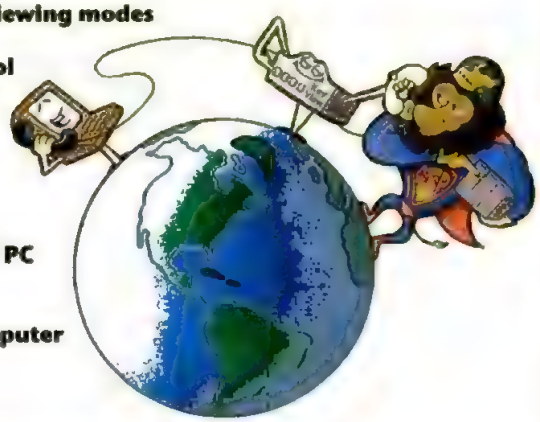

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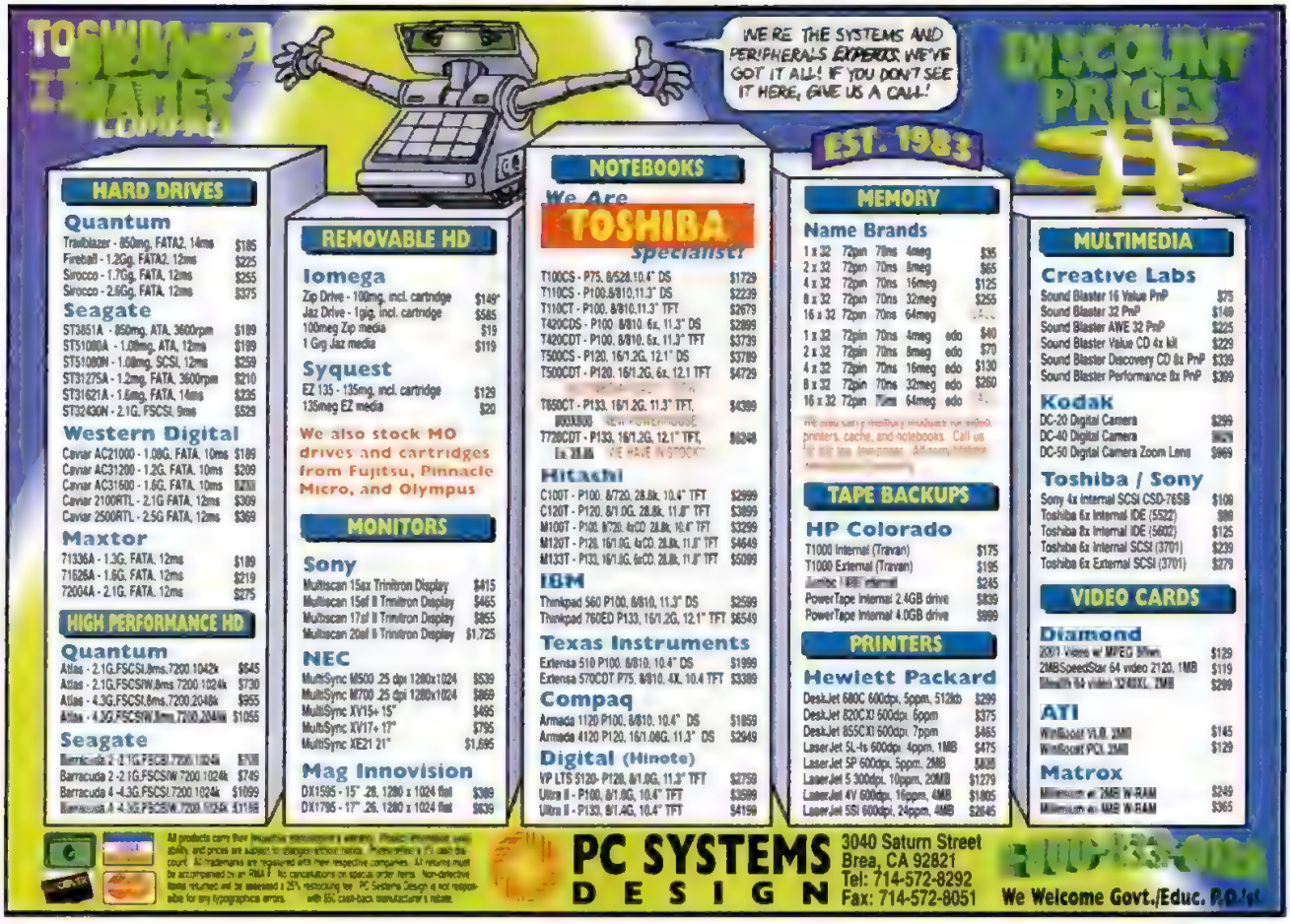

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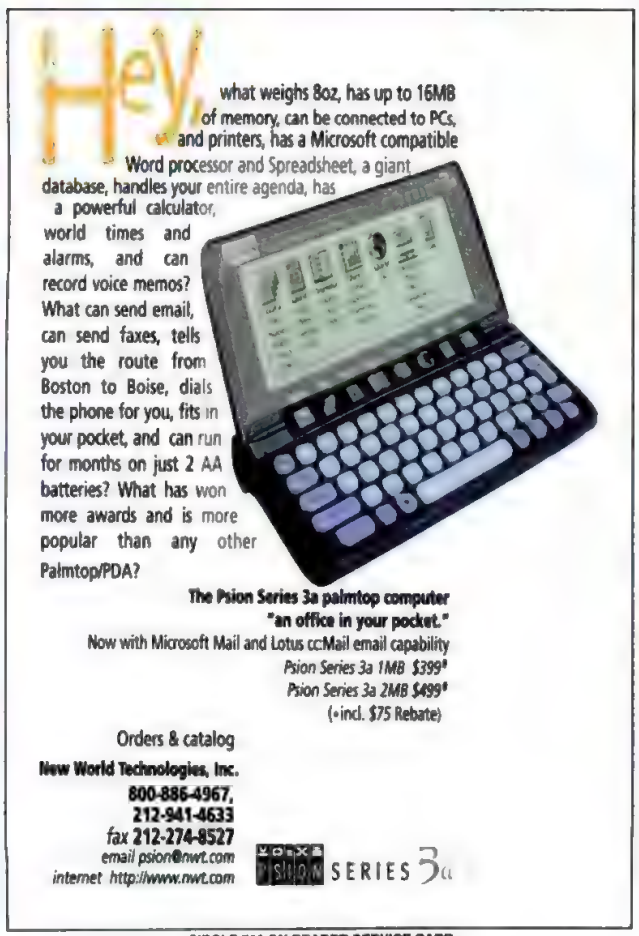

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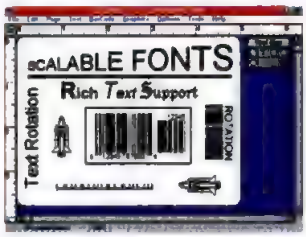

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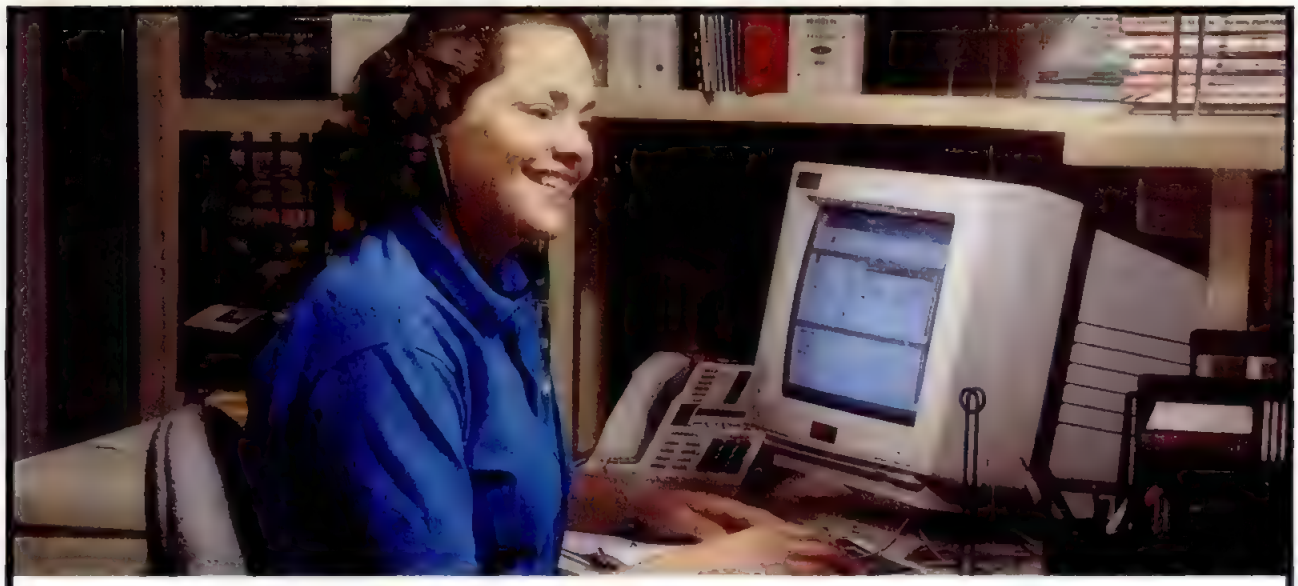

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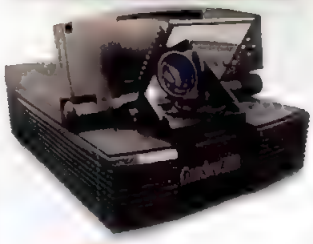

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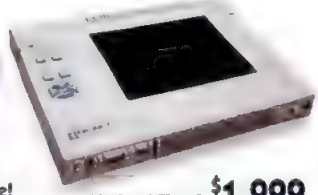

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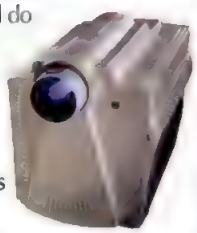

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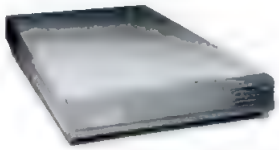

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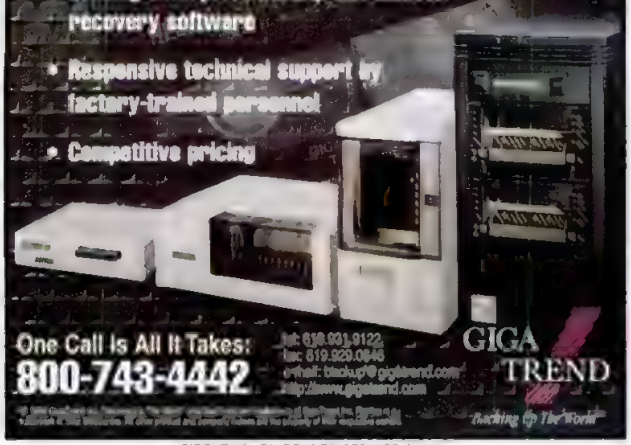

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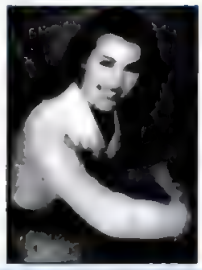

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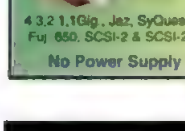

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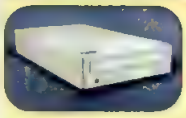

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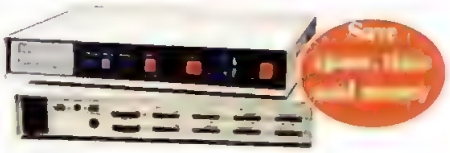

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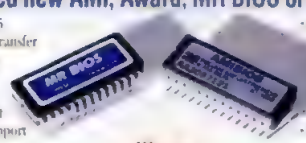

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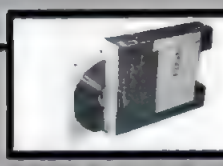

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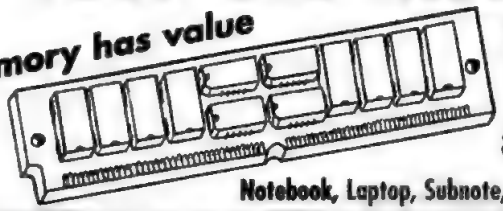

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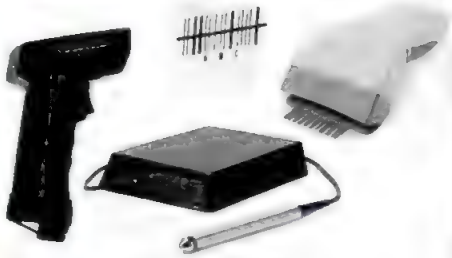

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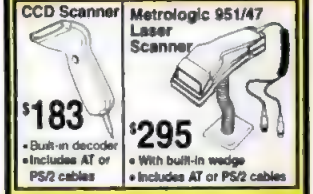

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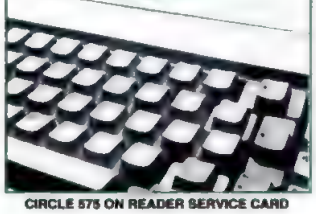

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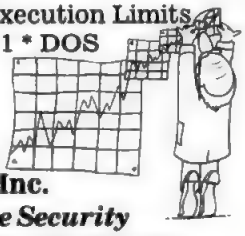

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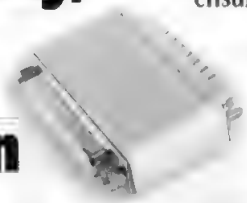

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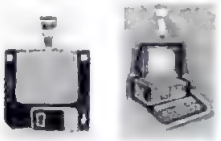

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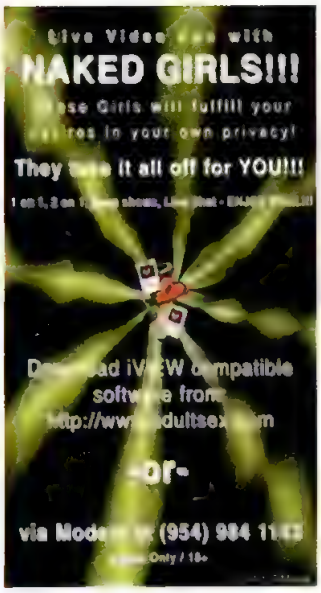

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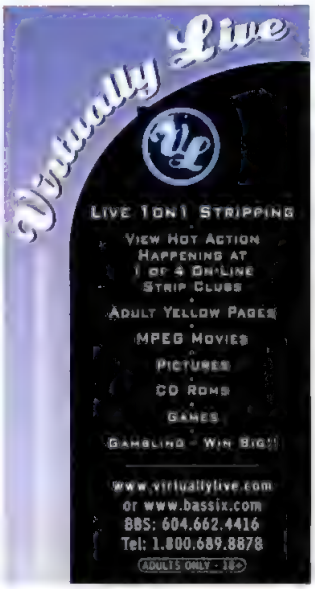

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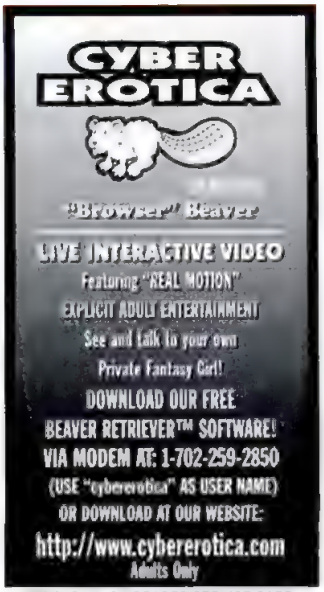

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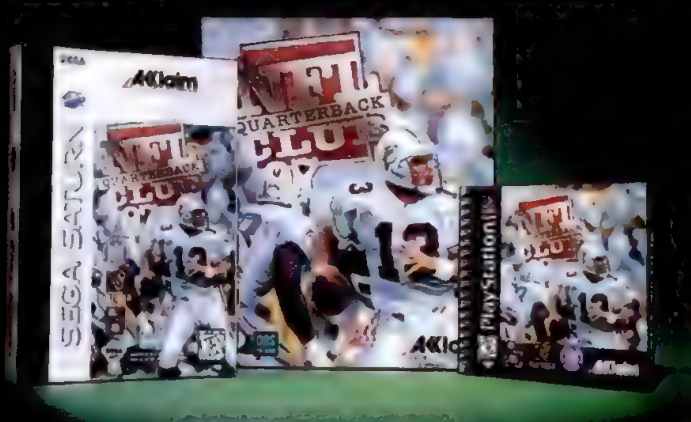

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After Hours

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Help! Help! I'm Being Repressed!

Let there be much rejoicing, because 7th Level has brought a cult classic comedy to life in this hilarious CD-ROM.

Monty Python and the Quest For the Holy Grail

Do you know the proper response to the question, "What is the airspeed velocity of an unladen swallow?" Do you cringe when you hear the word *ni* or when you see a fluffy white bunny? If you answered yes to any of these questions, chances are you're a fan of the British comedy troupe Monty Python and their classic film, *Monty Python and the Quest for the Holy Grail*. That means you could be one of the many PC-toting Python fans who will revel in 7th Level's latest CD-ROM.

Monty Python and the Quest for the Holy Grail is a Windows (3.*x* and 95) game that puts you in the role of Arthur, King of the Britons. You and your trusty servant Patsy have been charged with a sacred quest to find the Holy Grail. Together, you must roam the countryside and collect various items, clues, and companions (the Knights of the Round Table) to complete your quest.

As the game unfolds, many sights and sounds will be immediately familiar to fans of the film. Right off the bat, the unique look, feel, and humor of a Monty Python production are faithfully recreated in this game.

Each of the game's nine main screens are based on important locations from the film, such as Plague Village, Camelot, and the naughty Castle Anthrax. Most of the scenes and characters are depicted using actual footage from the film, and the animation is reminiscent of the paper-cutout style used in all Python shows.

At each location, you'll learn a little more of the story. At a few of the scenes, you'll get the chance to play games, such as Drop Dead—a rather grim take on Tetris—and Knights in Kombat, where you get to fight the Black Knight.

As you move through the game's scenes, you have to click all over the place to find all the bizarre but necessary items, such as the Black Knight's sword, Zoot's medallion, and Joseph of Aramethea. This is where some players may begin to tire of The Holy Grail. Although most mouse clicks will result in humorous video clips, animations, or sound bytes, you will have to click repeatedly in many places to find the items you need. By repeatedly we mean many, many times, not just three or four; in some places we actually lost count. This can get tedious in a hurry, even for Python fans.

But that's really the game's only drawback. The graphics are excellent, as are the sound and video. In fact, we found it extremely difficult to tear ourselves away from The Holy Grail even after hours of play. It's easy to lose track of time as you explore Arthur's world.

Of course, you will need to keep Monty Python's sense of humor in mind while playing. Much of the game's material is meant for mature audiences only, including a heavy dose of sexual humor and plenty of animated blood and gore. We agree with 7th Level that users should be 17 years or older.

If you're a Monty Python fan and you long to chat with Tim the Enchanter, you'll love this game.—*Michael E. Ryan*

IN AFTER HOURS

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Cartoons and Classics

These three titles bring classics—new and old—to the PC for you and your kids.

Buster and the Beanstalk

Nothing fits together more naturally than fairy tales and childhood. At least, that's the theory behind Buster and the Beanstalk, the new Tiny Toon Adventure for Windows 95.

The nine fairy-tale screens in this CD-ROM will allow your 3- to 9-year-old child to play around in modernized classics such as "Little Red Riding Hood," "Goldilocks and the Three Bears," and others. But living in fairy-tale land isn't the point of the game; you must help Buster climb the beanstalk and, along the way, find the magic key so he can unlock the giant's castle and regain the riches he lost.

It sounds easy enough, but this game is tricky and sometimes tedious. Babs Bunny, another Tiny Toons character, gives you clues that, when tracked down, will help you retrieve pieces of the key to the giant's castle. You unearth these clues by clicking on various objects within the screens. However, a clue can be in any one of the nine screens, and each highlighted object on each screen can be clicked on many times, with different objects popping out each time.

Finding the key is just the beginning. Once you have the key, you must storm the castle and retrieve the magic harp, the chicken that lays golden eggs, and the bag full of gold. If you get stuck, you can click on the cellular phone Buster carries with him, but we had trouble getting that to work.

To be fair, the animation in this game is spectacular; your children will undoubtedly enjoy it. And the results garnered by clicking within the screens will be certain to amuse them. However, expecting a 5-year-old to understand and remember obscure clues and snappy dialogue may be asking a bit too much. —*Sarah L. Roberts*

Disney's Animated StoryBook, Toy Story

By now, few among us are unacquainted with the tale of Woody the Cowboy and his nemesis-turned-ally Buzz Lightyear, a tale more commonly known as *Toy Story*. Though the holiday hype has died down, Disney continues to roll out products based on the movie, the latest being this CD-ROM version of the story. If your young ones are already taken with Hamm the talking piggy bank, Rex the neurotic dinosaur, the streetwise Mr. Potato Head, and the rest of the group, they will be thrilled with this foray into the world of *Toy Story*.

This adventure (which runs under Windows 3.*x* and 95 as well as on Macs) allows your 3- to 9-year-olds to be either passive observers or active participants. If a soothing hour in front of the computer is what's needed, then Hamm, who serves as guide, can read the travails of Woody and Buzz. But Hamm's rendition is only part of the show. The animation in the 15 story screens is outstanding as well as engaging, and after Hamm finishes his bit, additional dialogue and action follow.

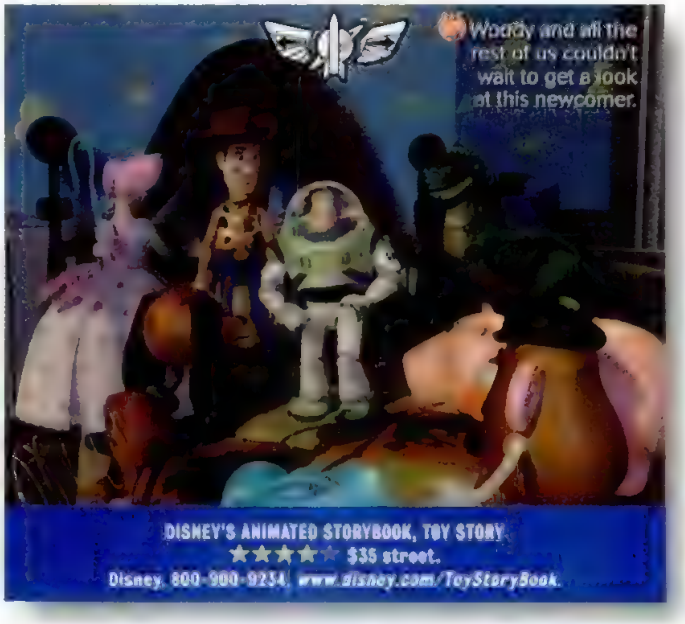
But the real treats are the five games in the interactive story section. In the Put-Away Game, the toys are in total disarray and it's up to your child to place them on the shelves where they belong. This game has three levels: The first asks your child to place the toys in their shadows, and in the other two, Woody offers vocal instructions.

The Crane Game is the most entertaining. It is your mission to be the leader and savior of the extremely small aliens whose lives depend upon the whims of the crane. This game will help your child with colors, counting, and coordination. The Escape Plan, Woody's Scheme, and the Maze Game are also kicks. So if your child just can't get enough of *Toy Story*, this CD will certainly entertain.—*SLR*

The Jungle Book

Panthers and tigers and bears (oh my!) will keep you hopping in the Windows (3.*x* or 95) version of Rudyard Kipling's classic *The Jungle Book*. In this game, your mission is to retrieve the stolen crown of King Louie, the monkey ruler, and return it safely to Monkey City. You'll be assisted in your quest by wacky Colonel Ilgwom (or Illy) his primate pal La-Tee, and the rest of the *Jungle Book* cast.

Your journey begins when Illy and La-Tee pull you out of quicksand and explain the particulars of how King Louie's crown has been stolen. As you proceed, all decisions are made by you: Illy offers no opinion at all, though La-Tee occasionally squeaks out guidance. You choose which path to take, but



be warned that some of your decisions may lead to dead ends. Along the way, you will hone your instinct, which is measured on the instinct meter. Each time you see a paw in the undergrowth, click on it, and you will be rewarded with instinct points and a video clip from the recent live-action remake of this classic tale.

To progress through the story, you will have to play one of many monkey games. You have two choices with these games: The first involves voice recognition (the game includes a microphone). With this option, you must mimic the sounds La-Tee makes in order to win. The second is to play the on-screen monkey board games, including Whack-a-Monk and Reverse the Monkey. These will challenge most youngsters.

Designed for 5- to 9-year-olds, The Jungle Book is quite exciting. The stellar video and myriad paths are sure to keep your child enthralled for hours.—*SLR*

QUICK CLIPS

Infinity City

The Gigglebone Gang is back in this fun and funky tour of Infinity City, the math capital of the world. The unique animation style and excellent design make this a great learning tool for kids age 4 to 8. $30 street; Headbone Interactive, 800-267-4709.

The Baseball Encyclopedia, Macmillan Digital's 1996 Edition

This comprehensive title would be a baseball fan's perfect source for statistics, except for the painfully slow database searches. $49.95 list; Macmillan Digital USA, 800-910-0099.

Total Mayhem

This *could* have been the equivalent of a multiplayer Crusader: No Remorse, if not for a few interface flaws and the moronic artificial intelligence. Patches from Eidos might help, though. $50 street; Eidos, 415-616-2022.

DeathKeep

Unless you're an absolute dungeon-crawl addict, you'll want to stay away from this one. Why? Dated graphics, choppy game play, and less-than-interesting monsters. $40 street; Strategic Simulations Inc., 800-601-7529.

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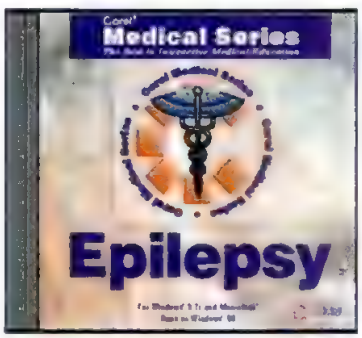

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Right on Target

Origin's Longbow is an impressive helicopter simulation for veterans and *novices.*

AH-64D Longbow

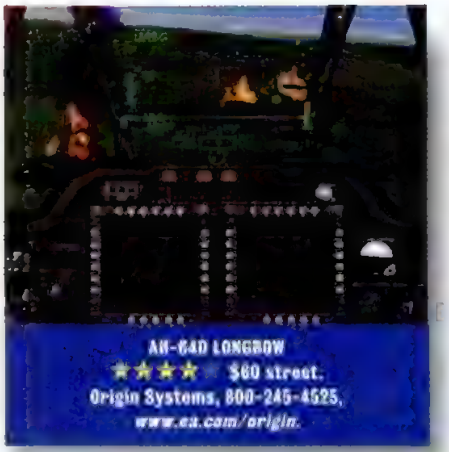
Origin Systems made its first foray into combat simulations with Strike Commander, an F-16 simulation with a fictional Wing Commander–like story line. Falcon 3.0 it wasn't, and hardcore sim fans scoffed at the simplistic flight model and arcadelike game play. But with AH-64D Longbow, Origin looks as though it will silence the critics.

This title (DOS-based but well-behaved under Windows 95) follows Electronic Arts' Advanced Tactical Fighters as the second release under the new banner Jane's Combat Simulations. Both titles were produced in conjunction with Jane's Information Group, which compiles the most complete civilian database of all the world's implements of war.

The AH-64D Longbow is the U.S. Army's formidable attack helicopter, which has seen action in Panama and Iraq. Andy Hollis (the brain behind such classics as Gunship and F-15 Strike Eagle) used actual Longbow manuals and design documents along with a slew of information from Jane's to create a well-rounded sim. With its adjustable realism, Longbow should appeal to most demanding armchair pilots as well as novice chopper jockies.

Longbow will take you through flight school so you can be up and flying an AH-64D in no time. The game's manual is excellent and detailed, but if you're impatient, Longbow's top-notch "live" flight instructor will help guide you through the basics.

Once you get into the air, you'll have to start thinking like a Longbow pilot if you want to survive. Life in a Longbow is all about stealth. As you nudge your chopper across the landscape, 150 feet above the ground and using hills to cover you from radar detection, you'll begin to feel paranoid about all the surface-to-air missiles that can knock you out of the sky. Luckily for you, the Longbow has teeth of its own. Each of the craft's sophisticated systems is elegantly and accurately modeled.



Longbow's graphics are impressive, using actual U.S. Geological Survey terrain maps to generate 20,000 square kilometers of battlefield. The game offers three graphics modes, but while the highest-detail settings are breathtaking, they will tax a well-equipped Pentium/90.

Longbow will take you through historical missions in Iraq, Kuwait, and Panama; hypothetical battles in the former Soviet Union; and randomly generated Instant Action missions for immediate gratification.

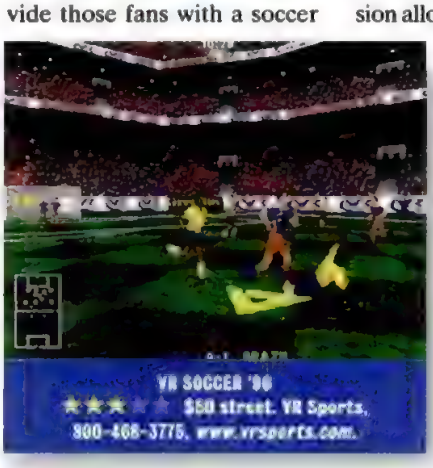
The only complaint? No multiplayer support (and the fact that even simulated helicopters are rather difficult to fly).—*Bernard H. Yee*

Getting into the Game

The world's most popular sport gets first-class treatment on the PC.

VR Soccer '96

Soccer may not be the most talked-about sport in the United States, but there certainly are plenty of soccer fans in this country. Fans who, for the most part, have to look long and hard for coverage of their beloved sport, let alone simulations of it. Finally there's a computer game that can provide those fans with a soccer fix, and a realistic one at that.



The first thing you'll notice about VR Soccer '96 is the game's brilliant SVGA graphics. With 3-D polygonal figures, richly detailed stadiums and fields, and motion-captured animations, VR Soccer is one of the best-looking sports games on the market. And the DOS-based game's Virtual Field Vision allows you to play in a 360-degree stadium, where camera views glide smoothly around the field. This results in some spectacular viewpoints, giving the game a TV-like appearance. The moving camera can be a bit disorienting and difficult to get used to, however.

The game comes with 44 international teams, each with a 22-man roster. You can customize the tournaments and cups and play any position except goalie. You can even play from a first-person perspective that puts you right down on the field.

One of the things we liked most about VR Soccer was the realistic game play. Instead of ridiculously high scores racked up by players performing near-impossible shots (such as bicycle kicks), VR Soccer does a good job of reproducing the low-scoring matches more common in the soccer world.

The game's few drawbacks include a lack of real players' names and a ridiculously complex instant-replay feature.

VR Soccer offers multiplayer support in the form of 4 players attached to a single system, or up to 20 connected over an IPX network.

So if you're a mouse potato looking for soccer thrills, VR Soccer '96 will get you as close as you're going to get without getting your cleats muddy. —*Shane Mooney*

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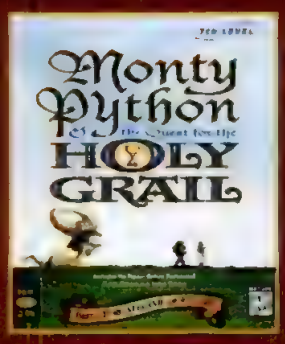

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PC MAGAZINE

Coming Up

Tomorrow's Desktops? A Sneak Peek

Take a look behind the scenes and under the hoods of two eagerly anticipated OS upgrades: Windows NT 4.0 and OS/2 Warp 4.0. We show you why they both differ from previous versions, why they're better, and why they may not be everything you expect. In addition to making a detailed examination of Windows NT 4.0 and OS/2 4.0 architectures, we look at NT's new face and OS/2's voice recognition capabilities. We preview some new applications being prepped for both of these operating-system upgrades. We also try to answer a question you may be asking yourself: Is either of these new OSs the best choice for your next corporate operating system?

Pentium Pro Business Desktops

If you've ever thought that Intel's top-of-the-line Pentium Pro is just too high-end, too powerful, and too expensive to deploy widely on the business desktop, think again. Aggressive new pricing structures and a deluge of 32-bit business and productivity applications now mean that you can power up your company with systems that can handle Windows NT Workstation with processing muscle to spare—many with prices under $4,000. We test 45 Pentium Pro business desktops equipped with Windows NT Workstation 3.51 using 32-bit benchmark tests to see which ones deserve a spot on your corporate LAN.

PC Magazine At Home: The Top 100 CD-ROMs

Get set for our third annual listing of the top 100 CD-ROMs available today. We present multimedia titles that will entertain, enlighten, and most certainly engage you and your family. You'll find an extensive list of children's educational software, as well as tools for the home office worker or hobbyist and a healthy selection of CD-ROMs for the avid gamer. This list is a must-have for the multimedia enthusiast; don't visit your favorite software outlet without it.

Microsoft ActiveX

Is ActiveX just a Microsoft marketing blitz? Or will it be a significant Internet standard? Our lead PC Tech story looks inside ActiveX controls, Microsoft's new ActiveX frameworks, the early tools for developing ActiveX Web applications, and the scripting possibilities that VBScript brings to ActiveX. In the issue after this, PC Tech looks at the Netscape Navigator platform from a similar perspective.

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Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott

Notes from the Police Blotter

"On March 20, a woman living on Providence Ln. reported that two computer disks had been taken sometime between March 15 and 17 from a disk holder. . . .Police did not call for backup."—*THE OVIEDO* (FLORIDA) *VOICE*

It's not the Lapleaf notebook-holding accessory that freaks us out, it's the furniture!

This Story Will Really Blow You Away

Faithful reader Brian Sayatovic found himself in the delightfully named town of Rabbit Hash, Kentucky, helping the friend of an old boss set up a PC. The friend's rustic cabin was decorated with plenty of guns, among other things. Ignoring warnings to be careful, the boss picked up a .22 revolver, and inevitably it went off, plugging a nearby HP LaserJet IIIp right in the front panel. After digging the bullet out, they tried to use the printer, and it worked just fine. Hmmm—that's one performance test PC Labs has never tried, but it does have a certain appeal.

Notebook Computer 9200 Series

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Much enjoy trouble at translation. (Anonymous Taiwanese brochure.)

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This copy must have been destined for the president. (CyberPilot Pro documentation.)

RICHARD TENNANT

"It's all here, Warden. Routers, hubs, switches, all pieced together from scraps found in the machine shop. I guess the prospect of unregulated telecommunications was just too sweet to pass up."

If your entry is used, we'll send you $50 and a *PC Magazine* T-shirt. Send your entries to Abort, Retry, Fail?, *PC Magazine*, One Park Ave., New York, NY 10016-5802 or via e-mail (text items only) to *don_willmott@zd.com*. Winners this issue: Ka-neng Au, Larry Lawver, Brian Sayatovic, and R.A. Swirsky.

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Dell's featured computer artist is Diane Fenster of Pacifica, CA.

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